

THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

ADVISORY EDITORIAL BOARD

FRED L. ADAIR
CHANNING W. BARRETT
C. L. BONIFIELD
W. W. CHIPMAN
H. S. CROSSEN
THOMAS CULLEN
ARTHUR H. CURTIS
EDWARD P. DAVIS
JAMES E. DAVIS
J. B. DELEE
ROBERT L. DICKINSON
PALMER FINDLEY

ROBERT T. FRANK
GEORGE GELLHORN
ALBERT GOLDSPOHN
WILLIAM P. GRAVES
HERMAN E. HAYD
BARTON C. HIRST
E. J. ILL
FLOYD E. KEENE
J. C. LITZENBERG
F. W. LYNCH
FRANKLIN H. MARTIN
C. JEFF MILLER

HENRY P. NEWMAN
GEO. H. NOBLE
REUBEN PETERSON
JOHN OSBORN POLAK
JOHN A. SAMPSON
F. F. SIMPSON
HENRY SCHWARZ
HOWARD C. TAYLOR
GEORGE GRAY WARD
B. P. WATSON
J. WHITRIDGE WILLIAMS

OFFICIAL ORGAN OF

THE AMERICAN GYNECOLOGICAL SOCIETY

THE AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS, AND ABDOMINAL SURGEONS;
NEW YORK OBSTETRICAL SOCIETY; OBSTETRICAL SOCIETY OF PHILADELPHIA; BROOKLYN
GYNECOLOGICAL SOCIETY; ST. LOUIS GYNECOLOGICAL SOCIETY; NEW ORLEANS GYNECOLOG-
ICAL AND OBSTETRICAL SOCIETY; AND CHICAGO GYNECOLOGICAL SOCIETY.

Editor, GEORGE W. KOSMAK
Associate Editor, HUGO EHRENFEST

VOLUME XVII
JANUARY—JUNE, 1929

ST. LOUIS
THE C. V. MOSBY COMPANY
1929

COPYRIGHT, 1929, BY THE C. V. MOSBY COMPANY

(All Rights Reserved)

(Printed in U. S. A.)

Press of
The C. V. Mosby Company
St. Louis.

The American Journal of Obstetrics and Gynecology

VOL. XVII

ST. LOUIS, JANUARY, 1929

No. 1

Original Communications

RADIUM THERAPY OF CARCINOMA UTERI*

TEN YEARS OF CLINICAL EXPERIENCE AND RESULTS AT THE
WOMAN'S HOSPITAL

BY GEORGE GRAY WARD, M.D., F.A.C.S., NEW YORK, N. Y.

I HAVE no apology to offer for having the temerity to bring to your attention a subject that has been so ably presented to you only a little more than a year ago by Dr. Polak, because, as he then pointed out, as yet the therapy of cancer of the uterus is by no means accepted and standardized as are most of our gynecologic problems, and because the literature is full of conflicting opinions as to the results obtained, and as to what is the most efficient technic. Therefore, in the hope that our few drops of clinical experience in the radium therapy of carcinoma uteri during the past ten years at the Woman's Hospital may act as a reagent to help clarify the hazy mixture of the various clinical reports, I beg leave to give you a survey of our observations and viewpoint as a small contribution toward bringing about the stabilization of the therapy which I am sure we all ardently desire.

It has been estimated that there are probably 300,000 suffering from cancer in the United States at the present time with a death rate of 89.4 per 100,000, and according to Hoffman 40 per cent of the women dying from cancer in 1923 had the disease in the genital organs or breasts. As you know scarcely any age is exempt; Dr. Bonner's case of carcinoma of the cervix in a girl of thirteen years has been recently reported. Our earliest age is twenty-six years. Twenty years ago, I published a report of a case of primary carcinoma of the vagina in a girl nineteen years of age. It may be of interest to note that this was my first experience with radium therapy. Through the

*Read by invitation at a meeting of the Brooklyn Gynecological Society, April 13, 1928.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

courtesy of Dr. Morton, son of the discoverer of ether anesthesia, we applied four tubes in tandem each containing 10 mg. of radium salt for one hour on three alternate days, it is needless to say, without any benefit.

In my opinion the outstanding contribution to the recent literature on the subject is Heyman's masterly study of the published operative and radiologic statistics of the leading clinics and authorities in Europe and this country, which he presented before the Scandinavian Surgical Society at Gothenburg in June, 1927, and it will well repay us to spend a few moments in a brief survey of his paper.

In this exhaustive analysis Heyman compares the radical operative results with irradiation for carcinoma of the cervix. He calls attention to the difficulties of giving a correct comparative evaluation of both methods due to the fact that while the radical operation has a background of more than twenty-five years with a completed technic whose further advance is not to be expected, radiologic therapy of cervical cancer has a scant fifteen years of experience with the war stopping much investigation, and with the technic still new and under development and by no means standardized. The prime obstacle to comparing the results of both methods is the marked difference in the initial material—that is the degree of progress of the disease when the case is first seen, the initial material coming to the radiologic clinics being mostly advanced (Classes III and IV) inoperable cases, while the reverse is true in the surgical clinics. The technic of the radical operation naturally developed from the most favorable cases and progressed to the more advanced ones. The reverse is the case with radium.

Heyman shows this in a table of operability percentages of different clinics, and reminds us that the hopeless cases were the only ones referred to the radiologist by the surgeon until recently, and points out that this unquestionable difference in the character of the initial material is an overlooked source of error working to the disadvantage of radium statistics. Therefore, it is evident that to obtain a proper evaluation we must compare the results of operation and irradiation in *operable cases only*.

This can only be done tentatively at the present time, because there are too few cases of irradiation available from all the clinics to compare with the great number of operable cases that have been operated radically and observed for five or more years.

In his comparative study of published statistics, Heyman has reduced the figures of all the clinics to one uniform standard. He has left out all doubtful statistics and does not deduct intercurrent deaths or nontraced cases, and quotes only the accepted five-year cure.

The *operative statistics* from twenty clinics reduced to the above standard show a total of 5024 cases of all classes of whom 905 had a five-year cure, or approximately 18 per cent. The results in the early cases (Classes I and II) show 3659 cases with 1303 cured, or .35.6 per cent. But the primary mortality from the operation was 17.2 per cent. The operability of the total cases seen was more than 43 per cent.

The *radiological statistics* from seventeen clinics reduced to the same standard show a total of 3512 cases of all classes with 571 cured for five years, or 16.3 per cent.

The results in the operable and borderline cases (Classes I and II) show 960 cases with 335 five year cures, or 34.9 per cent.

The primary mortality from irradiation would be probably less than 2 per cent (Radium-hemet was 1.59 per cent). The operability of the total cases seen was less than 30 per cent.

To recapitulate, Heyman's combined summary of *all* clinics shows:

Cures for total cases—Operative treatment = approximately 18 per cent; Radiologic treatment = 16.3 per cent.

Cures for operable and borderline cases—Operative treatment = 35.6 per cent; Radiologic treatment = 34.9 per cent.

Primary Mortality—Operative treatment = 17.2 per cent; Radiologic treatment = approximately 2 per cent.

While these figures apparently approach each other very closely, it must be evident that it is not fair to consider them as similar when we take into account the great difference in the character of the initial material as shown by a 43 per cent operability in the operative statistics as compared to less than 30 per cent in the radiologic figures.

The above general averages are interesting when compared with the results obtained at the Radium-hemet at Stockholm by Forsell and Heyman. From 1914 to 1921, inclusive, they treated 502 cases with an operability percentage of 29.1 per cent; 22.4 per cent were free from symptoms after five years. There were 145 operable and borderline cases with a five-year cure of 44.4 per cent. Their primary mortality from irradiation was 1.59 per cent.

These results contrasted with the general average of the operative treatment are certainly to the advantage of irradiation therapy, especially when we consider the character of the initial material from which these figures are compiled.

In 1925, we reported our results at the Woman's Hospital of two five-year series of radium therapy for carcinoma of the cervix before the American Medical Association. Our percentage of cures of all cases (76) was 23.6 per cent and for the early and borderline (operable) cases was 52.9 per cent based on cases traced, or 22.4 per cent, and 50 per cent when including the nontraced cases, to accord with Heyman's uniform standard, with a mortality of 1.6 per cent. Since that date we have completed two more five-year series and are now able to report on all cases treated in 1919, 1920, 1921, and 1922 and the first five months of 1923. Our records and follow-up end-result cards have been audited by Merwin and Davis, professional statisticians, and the figures I present to you have been compiled by them and certified as correct. This report includes only cases of primary carcinoma of the cervix treated by us by irradiation alone throughout the course of the disease.

We have treated a total of 154 cases of carcinoma of the cervix for five years or longer with radium alone during the nearly ten-year period that we have had radium at our disposal. One hundred thirty-four were primary cases treated with radium alone, of whom we have

traced all but eight with 23.1 per cent of five-year cures. There were 32 operable cases (early or borderline), Classes I and II, of whom we have traced all but 2 with 53.1 per cent of five-year cures.

We have 15, or 15.5 per cent, living six years; 11, or 15.5 per cent, living seven years; and 4, or 9.5 per cent, living eight years. These results compare with Heyman's combined statistics and with the Radium-hemet as follows:

<i>Total Cases Treated</i>		
<i>All Clinics</i>	} Operative treatment	18 per cent
	} Radiologic treatment	16.3 per cent
	Radium-hemet	22.4 per cent
	Woman's Hospital Clinic	23.1 per cent
<i>Operable Cases</i> (early and borderline)		
<i>All Clinics</i>	} Operative treatment	35.6 per cent
	} Radiologic treatment	34.9 per cent
	Radium-hemet	44.4 per cent
	Woman's Hospital Clinic	53.1 per cent

Although our total series is small as compared to the Radium-hemet, still it is encouraging to know that our last two five-year series maintain the percentages achieved in our previous report. It must be borne in mind that the percentages given for the borderline cases must always be of uncertain value, as "borderline" means confusion because it must depend entirely upon the personal equation of the surgeon. We are inclined to agree with Jeff Miller, that it is a useless classification for practical purposes and that we should simplify our statistics by having only two types—early and advanced. Likewise there must be uncertainty as to the term "operability," because one surgeon will consider operable and will operate on cases with definite involvement of the parametrial tissues, as for instance Victor Bonney, while many of us, who are conservative, will not consider a case operable unless the uterus is mobile and without infiltration beyond the cervix. Consequently, the figures given for "operable" cases will always be of unstable value for comparison also.

The lack of standardization of statistical reports is what complicates the problem of making fair comparisons. A cursory glance at the various reports published in the literature will show what a great variability exists in presenting the subject. Two, three and four-year results only add to the confusion and should be abandoned. Only five-year observations should be considered.

In reporting radium therapy statistics I believe that the five essentials should be:

1. A uniform classification as to the extent of the disease.
2. Five-year results of total treated cases, early and advanced.

3. Five-year results of the early cases—that is definitely confined to the cervix—operable cases.
4. The operability rate.
5. The primary mortality.

If all clinics would simplify their reports so as to follow these requirements, our task of giving proper values to the various technics employed would be greatly facilitated.

TECHNIC AT THE WOMAN'S HOSPITAL CLINIC

We have not a large amount of radium at our disposal at the Woman's Hospital; our armamentarium consists of some 280 milligrams of the salt in tubes and needles, and our average initial dosage has been from 2400 to 4200 milligram hours. It is of interest to note that the Radium-hemet at Stockholm also uses the salt in similar dosage, and does not use the emanation with massive amounts. Our results force us to believe that the employment of massive doses cannot show any better results than the intelligent application and reapplication of smaller doses.

We start with the principle that every case of cancer of the cervix is a study in itself, and that the *frequent personal observation* by the surgeon directing the treatment is absolutely essential to obtain results, and this personal contact must continue throughout the period of cure. As we cannot say when any case is permanently cured, this means the patient should be under observation at regular intervals throughout her life, if she would be safe, as we believe we have obtained our results by this constant watching enabling us to discover a recrudescence of the disease in its early stages long before the patient would be aware of symptoms. Thus we have the opportunity of putting out the fire while it is yet a small blaze by prompt reradiation, instead of having to try and extinguish a serious conflagration which would be present when the patient had developed symptoms. If there is an opportunity to plant a radium needle in a suspicious area at the onset of a recurrence, the problem is much simpler, as the chances of smothering the fire in its incipiency are greater. We, therefore, believe in repeated reradiations as often as indicated. Nearly 50 per cent of our cases have had more than one application, and many of our successful cases have had three or more irradiations. It is upon this personal frequent follow-up of our cases that we have based our treatment, and attribute to it whatever success we have had.

As we are familiar with what the post radiation picture should be at the end of each month, we think we can tell from the general appearance of the growth whether the several stages of hyperemia, local sloughing, separation of slough, and healing process with final cicatrization and marked contraction, which represent the phenomena of irradiation of the cervix by radium, are progressing satisfactorily.

This process, as we have observed it at our clinic, has been graphically shown in a paper published by Farrar. Our technic of application is simple and has been described in a previous report. We employ brass and rubber screening of the radium tube and distance screening with vaginal gauze for the protection of the bladder and rectum. We believe anchoring of the radium tube by suture is an important detail. We prefer the short needles to the long model for implantation in the periphery of the growth, and we believe the needles should not be closer to each other than two centimeters. Usually four needles are sufficient unless the growth is very large. We have found a self-retaining catheter inserted in the bladder during the time of the radium application is most satisfactory to all concerned.

Many of these patients are suffering from toxic absorption and are cachectic and anemic. During the sloughing stage of the radiation process there is necessarily an increased absorption of these toxins with resulting septic fever and an increase of the debilitated state. We have found that blood transfusion is an important adjunct to the irradiation in enabling these patients to combat this sepsis more successfully. Wherever possible we give these cases 500 c.c. of blood before their discharge from the hospital.

An important detail is to get the patient up early to favor drainage and to give careful instructions as to repeated daily douches of potassium permanganate solution to favor separation of the slough, to deodorize it, and to stimulate tissue growth.

Our results have been obtained without the employment of high voltage x-ray therapy as an adjunct as we have not the apparatus, and our employment of a moderate voltage as a post radiation treatment in some of our cases seemed harmful, and gave us no more satisfactory results than when we used radium alone. So for the present we do not use x-ray therapy in conjunction with radium as a routine. We believe, however, that high voltage attack on the lymphatic glands to produce a lymphatic block as an adjunct to radium therapy is theoretically correct, and if it can be done without associated injury to the adjacent viscera it would be ideal.

Observations during ten years' experience with the personal follow-up of our cancer cases has enabled us to form certain definite opinions as to what we may expect from radium therapy, and I have selected the following cases as illustrative examples of our experience from a special file labeled "remarkable cases."

a. *Hopeless Cases.*—We have learned to reserve judgment on the outcome of the apparently hopeless cases.

For instance, Mrs. B. (21680) came to us with extensive carcinoma of the cervix, Class III, in June, 1919. Her previous weight was 219 pounds. She had three applications of radium, the last in March, 1920, developed vesicovaginal and rectovaginal

fistulae, and was admitted to the House of Calvary in June, 1920, weighing 100 pounds as having but a short time to live. She returned to us in July, 1921 with the rectovaginal fistula healed, feeling fine and weighing 233 pounds. She has a vesicovaginal fistula, but fortunately it is situated high up, so that by frequent emptying of the bladder she is fairly comfortable and is strong and able to do her daily work. She is well today after 8 years and 9 months.

Another example is Mrs. D. (32729). Carcinoma of cervix, Class III; first treatment in August, 1923, second treatment in January, 1924, followed by intense reaction and severe pelvic pain with a loss of 60 pounds in weight. When I saw her in March, 1924 in her home, I considered her a hopeless case in the last stages, with probable involvement of the pelvic bones and pyometra. Three months later she was free from pain, and made a remarkable recovery. She is now, after nearly five years, free from all evidence of the disease, has regained her full weight and strength.

Miss J. (38771) and Mrs. B. (38526) made similar recoveries from apparent hopeless conditions.

b. *Repeated Irradiations.*—Our monthly inspections have enabled us to discover an early recrudescence or recurrence so that we can apply radium in time to stop the progress of the disease before it has gained headway and given symptoms. We have many examples of this.

Mrs. S. (33196) had 5 such irradiations. She is well after nearly five years. Mrs. O'B. (29692) had 4 treatments, the last in 1924. She is now well after 6 years. Mrs. S. (31244) had her first treatment in October, 1922; lost trace of her for two years, because she felt well. Returned in February, 1926, four years after first treatment, because of spotting. A small area of recurrence reradiated with needles. She has been perfectly well ever since, now five and one-half years. Mrs. W. (33839) had three treatments for recurrences; well since last treatment in November, 1925, now over four years. Mrs. F. (32186) two treatments, last in January, 1924, for recurrence, well now for five years. Mrs. B. (32267) had two treatments, recurrence in November, 1923, perfectly well, five years.

c. *One Treatment Only.*—In contrast to above cases of repeated irradiations being necessary we have some noteworthy instances of a single application of a moderate dosage resulting in a remarkable result.

Mrs. H. (25377), advanced carcinoma of cervix, Class III-IV. She had one treatment only in March, 1920, of 2400 milligram hours. Neither needles nor x-ray was used. Perfectly well and no evidence of the disease after eight years. A study of the slide shows that the type of cell in this case was of Group I according to Cutler's classification, or the most radioresistant. Mrs. H. (32769), Class II (early). One treatment of 2400 milligram hours, no needles or x-ray. Now well after four years and eight months. Type of cell was Group II of Cutler's classification. Mrs. K. (32130), Class II (early); 3600 milligram hours, now well after five years. The type of cell was Group I of Cutler's classification or *most* radioresistant. Mrs. N. (35053), Class III; 3600 milligram hours, symptom free three and one-half years. Type of cell is Group III of Cutler's classification or *least* radioresistant.

d. *Carcinoma of Cervix After Supravaginal Hysterectomy.*—We have encountered occurrence of carcinoma in the cervical stump after supravaginal hysterectomy in 11 cases during a period of seven years. Of these only 4 had been operated upon in the Woman's Hospital during which time 872 supravaginal hysterectomies had been done. The incidence is, therefore, probably less than 1 per cent.

Mrs. S. (22599). Supravaginal hysterectomy done on May 2, 1919, pathologic report showed adenocarcinoma involving the cervix. Twenty-four hundred milligram hours' irradiation on May 21, 1919, alive and well after nine years.

e. Irradiation and Subsequent Operation With Microscopic Examination of the Specimen.—We have had the opportunity to examine the uterus after radiation in several cases.

Mrs. T. (31782). Carcinoma of the cervix, Class III, with myoma uteri. Twenty-four hundred milligram hours of radium given in February, 1923, with apparent cure of carcinoma. Three years later, in May, 1926, a panhysterectomy was done because of the large myoma causing pain. The pathologist's report shows that the carcinoma was of the squamous-cell type, Group II of Cutler's classification. The uterus, removed three years later, contained several intramuscular and submucous myomas, the largest measuring 12 by 7 by 7 cm. The endometrium was pale and thin. There was no sign of tumor in the hard, pale, shrunk, cervix. Four different blocks, covering the cervix and the lower portion of the body were sectioned. None of them showed any trace of carcinoma. Many slides were examined. Sections from the appendages were also negative. She is well and symptom free, more than five years.

Mrs. R. (23708). Carcinoma of cervix, Class II, with myoma uteri. Twenty-four hundred milligram hours of radium applied in November, 1919. Two months later in January, 1920 a Wertheim operation was done. The pathologic report of the specimen shows the uterus to be enlarged 10 by 6 by 5 cm. The corpus contains a globular myoma of 3 cm. diameter. A broad portion of the parametria and a vaginal cuff of 2½ cm. width are attached to the uterus. The cervix shows deep lacerations and an eroded area on a bulging portion of one lip. About 1 cm. above the external orifice one finds a minute depression which is surrounded by a thick layer of the very hard fibrous tissue. There are no signs of a neoplasm in the cervix. One tube shows a hydrosalpinx of 3 by 10 cm. Microscopically, sections of the lymph glands show no changes. Section of the corpus shows atrophic mucosa. Among several sections of the cervix one finds one section which contains in an inflamed tissue space an oval structure composed of epithelial cells of the small type, but no trace of carcinoma. There are also normal cervical glands on the surface. Section of the ovary shows no oval follicles. On July 12, 1922 in the follow-up two years and six months after the Wertheim operation, a small nodule was observed on the anterior vaginal wall which was suspicious. Two radium needles were implanted on either side of this nodule for thirty-six hours on July 19, 1922, since which time she has been perfectly well, nearly eight and one-half years.

Mrs. P. (23684). Carcinoma of cervix, Class II, of four months' duration. Twenty-four hundred milligram hours of radium in May, 1919. On account of the unusual favorable conditions a Wertheim operation was done in November, 1919, six months later. The pathologic report states the specimen is a somewhat atrophic uterus 7 by 4 by 2 cm. with a thin mucosa. The cervix is lacerated, a vaginal cuff of 2 cm. width and a large amount of parametrial tissue is attached to the uterus. On either side of the cervical canal between the external and internal os are two lenticular projections from the mucosa ½ cm. in long diameter. These are firm fibrous and white on section and appear sharply denuded from the cervical stroma. Microscopic sections of the entire uterus show these areas to be dense cicatricial tissue sharply limited from the cervical stroma. They contain a few nuclei and are largely hyaline collagen fibrils. The remainder of this cervical stroma is rather dense and cellular. There are some dilated cervical glands but the mucosa is largely atrophic. Mucosa of the corpus uteri is thin, shows few glands which are of the

interval type and somewhat atrophic. Myometrial tissue throughout the corpus and fundus shows no changes. No section shows any trace of the original carcinoma. Unfortunately we have lost trace of this patient because she returned to her home in Spain. Our last account was two years after her treatment when we heard she was very well. This case is of especial interest because it has afforded us the opportunity to study the effects of a single application of radium on an early carcinoma of the cervix, and the very thorough sectioning of the entire specimen by Dr. Strong reveals no trace of cancer cells remaining six months later. Apparently the Wertheim operation was unnecessary in this case, and it affords a justification for the use of radium instead of operation in the disputed frankly early cases.

f. *Pyometra and Hematometra the Result of Postradiation Contraction.*—The occurrence of pyometra or hematometra as a post radiation complication we believe is an important factor to be remembered, because we have observed in our follow-up many instances of an apparent extension of the carcinoma as evidenced by increase in the size of the uterus and marked pelvic pain and temperature that on investigation proved to be a retention of purulent or bloody fluid in the body of the uterus as a result of stenosis of the canal following the contraction from irradiation. The passage of a sound will at once clear up the diagnosis and an occasional passage of dilators will suffice to correct this complication. We have several instances, where a hopeless prognosis was given, that are now alive and well, as the trouble was due to this condition and not to an extension of the disease.

Mrs. S. (33196). Carcinoma cervix, Class II, intracervical in location, from November, 1923 to November, 1925, she had four reradiations for recurrence, following the initial treatment. In October, 1925 a condition of pyometra was discovered which accounted for an acute condition. Divulsion and irrigation resulted in the evacuation of much slough and pus and a satisfactory cure, as she is now alive and well.

Mrs. K. (32130). Carcinoma cervix, Class II. Thirty-six hundred milligram hours in April, 1923. One year later symptoms of apparent extension of the disease, which proved to be pyometra. She was divulsed and irrigated and has been perfectly well ever since, now five years.

Undoubtedly the automatic evacuation of a pyometra accounts for the sudden improvement in the toxic condition of some of these patients which has led us to believe them to be hopeless cases.

g. *Postradiation Hemorrhage.*—We must expect the possibility of hemorrhage at the time of the separation of the slough resulting from irradiation. Usually this is not marked but occasionally it may be severe, requiring prompt packing and transfusion.

Mrs. S. (38462). Carcinoma cervix, Class II. Two irradiations, the last August 13, 1927. On October 19, 1927, she had a severe hemorrhage and was taken to the hospital for treatment. Today she is free from all symptoms.

h. *Fistulae.*—The occurrence of fistulae is an unfortunate complication of irradiation, although it is difficult to say whether the fistula develops as a result of the therapy or the disease. Both are undoubt-

edly factors in some instances. As our experience increases in the application of radium we should expect a decreasing percentage of these sequelae. In 196 cases we had 9 cases with fistulae. Our experience has been that the rectovaginal fistulae will tend to heal spontaneously, while the vesicovaginal will persist but may be closed by operation.

In the case of Mrs. B., previously referred to as with rectovaginal and vesicovaginal fistulas and now alive and free from symptoms of carcinoma after eight years and ten months; the rectovaginal fistula healed spontaneously.

Miss J., aged thirty years. Carcinoma cervix, Class III. Three thousand six hundred milligram hours of radium given on February 7, 1927. June 7, 1927, she was in a very bad condition and was referred to House of Calvary as hopeless. November, 1927, well with no evidence of carcinoma but has a vesicovaginal fistula, circular in shape about 2 cm. in diameter at the cervicovaginal junction in a nulliparous vagina. As a rule we have avoided operation in these cases fearing that the dissection might liberate some imprisoned dormant cancer cells and disseminate them, but at the urgent request of the patient whose condition was intolerable, we operated last February and fortunately were successful in closing the fistula.

i. *Carcinoma of Fundus*.—While it is generally agreed that panhysterectomy gives a sufficiently high percentage of five-year cures in carcinoma of the fundus, yet in our experience we have not been able to operate in over 50 per cent of our cases because of the poor surgical risk. These patients are frequently advanced in years, and complicated with obesity, cardiovascular disease, deficient renal function, or diabetes. We have, therefore, had to resort to radium therapy alone in such cases. Our method of choice is first to apply radium to the body of the uterus and later do a panhysterectomy.

Heyman's report shows that the result in operable cases from several clinics gives a cure in 58.8 per cent, while the Radium-hemet with radiologic treatment alone has 60 per cent. Our figures have not been completed to date, but in a previous report approximated those quoted by Heyman. It is our custom to resort to a diagnostic curettage when the diagnosis is in doubt in suspected fundus carcinoma. An instance of repeated failures of the curettage to determine the diagnosis is possible.

Mrs. B. (36306), seventy years old, had suspicious symptoms and was curetted twice with negative findings; as the symptoms continued, a third curettage was done with positive finding of adenocarcinoma.

Mrs. R. (25917), very obese and poor surgical risk. Adenocarcinoma of fundus, 2 tubes 50 milligrams in tandem were applied for thirteen hours in June, 1920. On account of a recurrence of symptoms, a second irradiation was given for twenty hours in December, 1921. In November, 1925, needles were implanted in a metastasis on the anterior vaginal wall. She is now symptom free after nearly eight years, showing what may be done in a poor risk by repeated irradiation.

Mrs. H. (36640). Adenocarcinoma of fundus. Two thousand four hundred milligram hours of radium to fundus in June, 1922. In January, 1923, the uterus was

smaller and mobile, but there was still some discharge. A panhysterectomy was done and the pathologic report shows active adenocarcinoma in the cavity. This illustrates the advisability of operating wherever possible, as this patient has been alive and well for nearly six years.

Mrs. P. (25265), aged sixty-five years. Adenocarcinoma of fundus. Two thousand four hundred milligram hours of radium in February, 1920. A panhysterectomy was done one week later and a second application of 1500 milligram hours of radium to the vaginal vault was made twenty-five days after the operation. The patient had marked vesical irritability for some weeks after the second irradiation but made a good recovery. The subsequent history is interesting. In 1921 she had a mild stroke, but recovered. In 1925 she was married. In 1926 she had a second stroke from which she recovered. She is now well and happy at seventy-three years of age after eight years.

PROGNOSIS FROM THE TYPE OF CELL

In view of the interest that has been aroused by Martzloff, Cutler and others on the possibility of making a prognosis as to the probable reaction to irradiation in accordance with the predominating type of cell in cervical carcinoma, I have had Dr. Plaut, our pathologist, study the type of cell in this series of outstanding results that I have given as examples.

In 23 of this group, excluding the adenocarcinomas, the distribution in accordance with the classification of Cutler is as follows:

Group I (adult)—5 cases (most radio resistant)—22 per cent.

Group II (plexiform)—16 cases (intermediate)—69 per cent.

Group III (anaplastic)—2 cases (least radio resistant)—9 per cent.

Cutler's average of distribution in 200 cases was Group I 17.5 per cent, Group II 61.5 per cent, and Group III 21 per cent. Dr. Plaut states, "Looking for an explanation of the favorable result of radium therapy in these cases, remarkable from the clinical standpoint, we cannot find it in the histologic group according to Cutler. Among the 23 favorable cases there is no higher percentage of the anaplastic tumors (Group III) which are supposed to give the best results with irradiation, and the percentages of the highly differentiated tumors (Group I) which are expected to give a poor result with irradiation is even higher than the average given by Cutler for all cases."

While we hope that the grading of the type of cell may prove to be as reliable an index of prognosis as some pathologists expect, still we are inclined to believe with Plaut that there is at present a bewildering mass of contradictory evidence as to its value.

PROPHYLAXIS

The rôle of chronic irritation as an etiologic factor in the development of carcinoma makes it imperative that lacerations and erosions of the cervix should not be neglected. In a study by Farrar of 300 consecutive case histories of cancer of the cervix at the Woman's Hos-

pital, it was found that pregnancy had occurred in 96 per cent. In 288 cases 11.1 per cent of the patients had had the last pregnancy less than five years and 20.3 per cent less than ten years before entering the hospital for the malignancy. We believe that the immediate repair of cervical lacerations when done under proper conditions, as in a hospital, will lessen the danger of subsequent development of carcinoma in the cervix.

DANGER OF THE USE OF RADIUM BY THE INEXPERIENCED

We wish to sound a warning as to the real danger of the indiscriminate application of radium by those inexperienced in its use. Commercial organizations exploiting radium send broadcast alluring literature offering to any physician advice and facilities as to dosage and technic on receiving the history of a case. We know of several instances of serious permanent damage being done through the careless and ignorant application of radium by those not qualified.

A recent case occurred in a young woman, aged twenty-seven years, who had one child delivered at the Woman's Hospital four and one-half years ago. A year later, in another city, she was given radium treatment because of menorrhagia. The radium was kept in situ for *three days and ten hours* with severe reaction and invalidism. She now has a small atrophic uterus and senile vaginitis with marked menopause symptoms and is anxious for another child.

Expert experience is necessary to obtain the best results and to avoid harm.

CONCLUSIONS

In conclusion I wish to draw attention to the following creed which I hold.

There is less primary mortality, less morbidity, less loss of time with radium therapy than in the radical operation for carcinoma of the cervix.

The palliative results in cases not permanently cured are an important advantage, not to be ignored.

The morbidity results of the radical operation, fistulas, thrombosis, suppuration, etc., are not to be forgotten.

Vesical and rectal fistulas should be increasingly less frequent in radium therapy as the technic develops.

Repeated irradiations are of distinct value, and subsequent treatments should be based on the reaction to the initial or test dose.

A personal monthly inspection or follow-up is an essential throughout the period of observation, in order that by a watchful waiting we may discover a recurrence in its incipency and thus extinguish the fire before it has gained headway.

We should be careful not to give a positive unfavorable prognosis until *after* the sloughing stage has terminated, and we should watch out for pyometra.

Large amounts of radium are not necessary to produce results.

There is a great need for the standardization of our statistical reports.

The immediate repair of cervical lacerations is a valuable prophylactic measure.

We believe that our results show that radium is preferable in all classes of cervical carcinoma. We also believe that in the very early cases the radical operation will give the same result as radium, *but* at the cost of high primary mortality and greater morbidity.

We agree with Polak's statement that all borderline cases fall within the range of radium and not operation.

As to the early cases—and how few we see—with the present statistical figures available, it is not yet proved which gives the best results, but the available figures do *not* show that the operation is any better than radium.

48 EAST FIFTY-SECOND STREET.

(For discussion, see page 126.)

CHANGES IN THE LEUCOCYTES DURING LABOR AND THE PUERPERIUM

A REVIEW OF THE LITERATURE AND AN ANALYSIS OF FIFTY-FIVE CASES

BY JULIUS JARCHO, M.D., F.A.C.S., NEW YORK

(Attending Obstetrician and Gynecologist, Sydenham Hospital; Attending Gynecologist, Beth David Hospital and Home of the Daughters of Abraham; Consulting Gynecologist, Hastings Hillside Hospital)

BUT little attention has been given to the changes in the leucocytes during labor and their possible significance. Other than to mention that leucocytosis occurs during labor, the textbooks on obstetrics hardly consider this subject. It was thought, therefore, that a complete survey of the literature together with an independent investigation might prove of interest to those who desire specific information of this nature, even though the study does not reveal facts of clinical value.

PREVIOUS INVESTIGATIONS

Hibbard and White¹⁹ made total white blood cell counts in 55 cases of labor and differential counts in 19 cases. In 75 per cent of all the cases, and in 84 per cent of primiparae, they found leucocytosis during labor. The average white blood cell count for primiparae was 15,021; for multiparae, 11,700. When the total white cell count was normal, the differential count also was unchanged. However, in the patients with leucocytosis, there was both a relative and an absolute increase in the polymorphonuclear neutrophils, while the lymphocytes were relatively decreased with normal or diminished absolute values.

Habl¹⁶ confirmed the findings of Hibbard and White with respect to the degree of leucocytosis during labor. In a series of 36 cases, the average white blood cell count was 15,380 for primiparae; 12,940, for multiparae. Furthermore, the leucocytosis was due to both a relative and an absolute increase in the polymorphonuclear cells. When leucocytosis reached its peak, the eosinophiles were decreased both relatively and absolutely.

Carton⁷ reported the total and differential counts in 10 primiparae and in 10 multiparae. During labor the number and percentage of neutrophiles were increased, while the eosinophiles were either absent or greatly diminished. There was a rise in the eosinophiles and mononuclear cells during the puerperium, keeping pace with the drop in the polymorphonuclears. In cases of puerperal infection, the absolute number and percentage of the polymorphonuclears remained persistently high.

Birnbaum⁴ likewise observed leucocytosis with a relative and absolute increase in the neutrophiles during labor. Primiparae averaged 92 per cent neutrophiles; multiparae, somewhat less. Except in cases of infection, normal differential values were established by the fourteenth day postpartum.

Arneth^{1, 2} found a leucocytosis over 10,000 in all but one case of a series of eight, including six primiparae and two multiparae. When the Arneth count was done, a definite shift to the left was found; that is, the polymorphonuclear cells of Groups I and II of the Arneth formula were increased at the expense of those of the remaining three groups. In one case in which the total leucocytes remained at the normal level of 8,000, the percentage of neutrophiles in the Arneth Group I was 34 per cent, the normal being only 5 per cent.*

Pankow²⁴ found an increase in the total leucocyte count during labor, which persisted for a few hours after the delivery of the placenta and then declined, often quite rapidly, if there were no complications.

Given¹⁴ obtained counts during the first stage of labor or within twenty-four hours of delivery which largely confirmed the work of earlier observers. He noted leucocytosis with both a relative and an absolute increase in the neutrophiles and a corresponding fall in the lymphocytes, followed by a rapid rise of the latter cells during the puerperium. He found, however, but slight change in the percentage of eosinophiles; whereas most observers have noticed a pronounced drop in these cells during and immediately following labor.

Blumenthal^{5, 6} found the polymorphonuclear leucocytosis during labor to be due to an increase in the number of young forms; that is, there is a shift to the left by the Arneth count. When the count was made after rupture of the fetal membranes, the degree of leucocytosis was lessened and the eosinophiles practically disappeared. After separation of the placenta, leucocytosis was more marked than during the first stage. At this time, Blumenthal found the polymorphonuclears much increased, the mononuclears diminished both relatively and absolutely, the eosinophiles absent, and an increase in the younger forms of the neutrophiles. After labor the differential count returned to normal and the eosinophiles reappeared.

Horvath²⁰ found that the leucocytosis of labor reaches its peak in from three to seven hours after delivery. The lymphocytes are decreased relatively but not absolutely. He noted a disappearance of the eosinophiles during labor and an Arneth shift to the left, the neutrophiles of the Arneth Groups IV and V being considerably diminished.

Dietrich¹⁰ observed that the increase in the white blood cell count begins with the onset of labor pains and continues throughout labor and for some hours afterward. In 16 of 19 cases, the eosinophiles and basophiles disappeared entirely; but

*References 15, 22, 23, 26 were included in the original text, which has been shortened for lack of space. These references, however, are of importance, and I have left the original numbers as changing them would mean changing type numbers through the entire article.

the eosinophiles reappeared by the end of the first day. The normal differential count was reestablished by the third day.

Doi¹¹ reported 28 cases in which the findings confirmed those of earlier observers with regard to the degree of leucocytosis and the changes in the neutrophiles, lymphocytes, eosinophiles, and Arneth count. He found that the longer the duration of labor, the more gradual was the return to normal in the total count. However, a normal reading was always obtained after twenty-four hours in uncomplicated cases. In the early days of the puerperium the small lymphocytes tend to increase, the large lymphocytes, to decrease.

Sieben²⁸ noted a disappearance of the eosinophiles in 50 per cent of cases during labor. In some instances there was an absolute decrease in the lymphocytes. The mononuclears, basophiles, and transitionals were reduced after labor; often they were entirely absent.

Chamorro⁸ found an average of 75 per cent of polymorphonuclear cells in the blood of primiparae during pregnancy. At parturition the average was 22.66 per cent of small lymphocytes, 3.13 per cent of mononuclears, and only 0.01 per cent of eosinophiles; the transitional cells were normal, that is 1 per cent. In multiparae, the average polymorphonuclear count was 83.66 per cent, and the lymphocytes underwent a marked reduction, averaging 14 per cent.

Baer³ made an exhaustive study of the leucocytes in pregnancy, labor, and the puerperium, basing his observations on 100 cases in which the counts were taken during labor and once daily thereafter for ten consecutive days. Primiparae showed a higher leucocytosis than multiparae, the average total count for 30 primiparae being 18,255 during labor with the high point, 19,883, on the first day of the puerperium and a gradual reduction after that. The average among 57 multiparae during labor was 13,467, with the high point, 15,062, on the first day of the puerperium. With each successive labor, there seemed to be a decreased reaction on the part of the leucocytes.

During labor the average differential counts in the 30 primiparae was 83.2 per cent neutrophiles, 10.8 per cent small lymphocytes, 3.5 per cent large lymphocytes, 1.7 per cent eosinophiles, 0.3 per cent transitionals, and 0.5 per cent mast cells. On the first day of the puerperium, the counts were as follows: 81.7 per cent neutrophiles, 10.3 per cent small lymphocytes, 3.5 per cent large lymphocytes, 3.0 per cent eosinophiles, 0.1 per cent transitionals, and 0.4 per cent mast cells.

During labor the average differential count in 57 multiparae was 77.7 per cent neutrophiles, 16.3 per cent small lymphocytes, 4.1 per cent large lymphocytes, 0.5 per cent eosinophiles, 0.6 per cent transitionals, and 0.8 per cent mast cells. On the first day of the puerperium, the average count was as follows: 79.2 per cent neutrophiles, 12.8 per cent small lymphocytes, 5.3 per cent large lymphocytes, 1.1 per cent eosinophiles, 0.8 per cent transitionals, and 0.8 per cent mast cells. The eosinophiles were entirely absent during labor in about half the cases of this series, reappearing in normal proportions on the first day postpartum.

In summarizing the findings the author stated: "Differential analysis showed the increase in leucocytes to be chiefly in the polymorphonuclear neutrophiles with a return to normal proportions by the third day of the puerperium, an absence of eosinophiles in about half the cases in labor, and their reappearance in normal proportions on the first day of the puerperium. . . . The small lymphocytes were diminished as the polymorphonuclear leucocytosis increased, and the large mononuclear, transitional forms and mast cells maintained normal percentages." Baer also noted that the Arneth analysis showed a displacement toward the left, i.e., toward Classes II and III; but this was not constant.

Jerlov's²¹ observations helped to corroborate existing views with regard to the number and percentages of the leucocytes during labor and the puerperium. In 19 cases studied immediately after delivery, the average count was 16,055, 14,220 of which were neutrophiles. Polymorphonuclear leucocytosis was somewhat more

marked in primiparae than in multiparae. The lymphocytes were diminished in absolute numbers, averaging 939 cells. Disappearance of the eosinophiles was observed by Jerlov, as by other investigators. In complicated cases, neutrophilic leucocytosis persisted and the eosinophiles failed to return at the usual rate, particularly in cases of infection.

As recent writers on the subject have utilized the Schilling hemogram in studying their differential blood counts, it is necessary to refer in some detail to this diagnostic method.

According to Schilling^{26, 27}, the normal total leucocyte count is 6,000 to 8,000. For the differential count he classifies the leucocytes as follows: basophiles; eosinophiles; neutrophiles, including four classes—myelocytes, immature cells, cells with rod-shaped nuclei, and cells with segmented nuclei; lymphocytes; and monocytes. The total and differential count is shown by a "hemogram," in which the following abbreviations are used for the different types of leucocytes:

B—basophiles; E—eosinophiles; neutrophiles; M—myelocytes, J—Jugendliche (immature cells), St—Stabkernige (rod-shaped nuclei) and S—Segmentkernige (segmented nuclei); L—lymphocytes; Mon—monocytes.

The hemogram shows the percentage of each type of leucocyte. The normal hemogram is given by Schilling as follows:

NUMBER OF LEUCOCYTES	B	E	M	J	ST	S	LY	MON
6000-8000	1	3	—	—	4	63	23	6

J (immature cells) may be present in normal blood up to 1 per cent. Myelocytes are not present in normal blood.

Fuss¹³ found that the neutrophilic cells show a definite displacement to the left in Schilling's hemogram during labor. This change is most marked in primiparae without complications. In the puerperium the displacement to the left tends to disappear, unless there is some complication. The neutrophiles react promptly to any complication with a renewed shift to the left. In sepsis Fuss states that the immature forms (J) and the myelocytes (M) show unusually high percentages.

The blood picture in labor, according to Fuss, is characterized by the following: a displacement to the left of the neutrophilic leucocytes, sometimes with very high percentages of those with the rod-shaped nuclei (St); disappearance of the eosinophiles; diminution of the lymphocytes, often with a rapid fall in their count; and diminution of the large mononuclears. From the second day of the puerperium in uncomplicated cases, there is a tendency for the blood picture to return to normal.

The observations of Saidl and Tuma²⁵ helped to corroborate previous work on the subject. In their experience, based on observations on 104 childbearing women, the differential values vary greatly in pregnancy, labor, and the puerperium. The leucocytosis is due especially to an increase in the neutrophiles. In multiparae, leucocytosis is less common. At the beginning of labor, there is an increase of neutrophiles. In the puerperium, the number of neutrophiles drops again, while the lymphocytes are increased. The neutrophilia is also associated with a slight displacement to the left. Contrary to most observers, Saidl and Tuma did not observe a diminution of the eosinophiles during labor.

Heyn¹⁵ employed Schilling's hemogram for differential counts in 20 cases during the last week or two of pregnancy, during labor, and postpartum. Of these 20 patients, 14 were primiparae and 6 were multiparae. The hemograms showed an increase in the polymorphonuclear percentage and a diminution in the percentage of lymphocytes with but slight absolute decrease. A definite displacement to the left of the polymorphonuclears in the Schilling hemogram was noted. In 3 cases,

a few myelocytes were present. Eosinophiles were found in only 6 of the 20 cases, and then in small percentage.

In the puerperium, the leucocytosis noted during labor diminished progressively in uncomplicated cases, often quite rapidly. The rapidity of the decrease in the white cell count postpartum was proportional to the rapidity of the increase during labor. The diminution in the total leucocyte count was accompanied by a diminution in the percentage of the polymorphonuclear neutrophiles and a disappearance of the displacement to the left. The relative lymphocyte count often increased rapidly. This relative lymphocytosis persisted in several cases during the period of lactation.

Crawford⁹ noted leucocytosis during labor in 50 Chinese women, averaging 14,100 cells. The count rapidly fell after labor. Maxwell and Yang²² confirmed this finding in a study of 10 childbearing Chinese women. The average count during labor in their cases was 15,175, reaching a peak of 17,960 within twenty hours. They also noted an increase in the percentage of neutrophiles and a diminution in the lymphocytes during labor, but disappearance of the eosinophiles occurred in only two of their cases.

Würzburger³¹, utilizing Schilling's hemogram, noted slight leucocytosis in some cases in the last days of pregnancy, an increase in the white cells immediately after labor, a return to normal in the puerperium, and a displacement to the left in the neutrophiles after labor. Any complication in the puerperium interfered with the return of the blood picture to normal. Würzburger gave the accompanying figures as average hemograms in the latter part of pregnancy, immediately after labor, and in the puerperium, respectively:

		LEUCOCYTE								
TIME		COUNT	B	E	M	J	ST	S	L	GR. M.
1	{ In pregnancy	8,900	—	—	—	5	18	56	20	1
2		9,400	—	—	—	7	20	50	23	—
3	{ Immediately after	9,300	—	—	—	10	20	45	25	—
4		10,100	—	—	—	8	11	60	21	—
5	In puerperium	7,800	—	—	—	5	8	68	19	—

Haeusermann¹⁷ made differential leucocyte counts according to Schilling's hemogram in 120 normal labors, 7 cases of eclampsia, 6 of preeclampsia, and 2 of puerperal fever. He found no absolutely characteristic hemogram during labor, especially in multiparae. There was usually a diminution in the eosinophiles, which disappeared entirely in some cases, especially in primiparae. Myelocytes were never found, and immature cells were rare. The neutrophiles with rod-shaped nuclei were usually increased, but occasionally diminished. There was, as a rule, a definite increase in the cells with segmented nuclei. The lymphocytes were often so much diminished that it could be said that there was a lymphopenia. This was not invariably the case, as occasionally the lymphocytic percentage was almost normal. Haeusermann found a tendency to displacement to the left in the hemogram during labor, but it was not so marked as in the cases reported by Fuss. He believes that this displacement to the left is of no significance in labor, and in normal cases it decreases or disappears by the second or third day postpartum. If it persists or increases, it indicates some complication. If the eosinophiles reappear and the lymphocytes increase in cases with postpartum fever, even though displacement to the left persists, Haeusermann maintains that it indicates a benign process. In a case of fatal puerperal infection, the hemogram showed absence of eosinophiles, appearance of a few myelocytes, increase in immature cells and cells with rod-shaped and segmented nuclei, and diminution in the lymphocytes. In eclampsia, there was always a definite displacement to the left in the hemogram with an increase in the immature cells and cells with rod-shaped nuclei, which condition disappeared after delivery and cessation of the eclamptic attacks.

REPORT OF PRESENT STUDY

In 55 cases of labor, routine differential counts of the white blood cells were made on six different occasions; namely, (1) on admission; (2) just before delivery, that is, from fifteen minutes to one hour before the birth of the child; (3) just after delivery, that is, from fifteen to thirty minutes after the birth of the child; (4) twenty-four hours after delivery; (5) five days after delivery, and (6) ten days after delivery.

The blood smears were taken by the intern in each case and stained by an expert hematologic technician. The stains used were Wright's and Giemsa's. For each count, the technician enumerated 400 cells. His work was personally supervised.

TABLE I. AVERAGE DIFFERENTIAL BLOOD COUNT IN TWENTY-THREE NORMAL CASES

	POLY- MOR- PHONU- CLEARS	SMALL MONONU- CLEARS	LARGE MONONU- CLEARS	EOSINO- PHILES	BASO- PHILES	TRANSI- TIONALS
ADMISSION	75.0	21.0	2.7	0.06	0	0.91
Just before delivery	78.6	18.1	2.2	0.02	0	0.94
Just after delivery	77.8	19.7	2.2	0.04	0	0.86
24 hours after	76.4	19.8	2.4	0.33	0	1.02
5 days after	73.9	21.7	2.6	0.83	0	0.91
10 days after	72.3	23.2	2.6	0.99	0	0.83

For the sake of convenience, I have divided the cases studied into three groups; namely, (1) normal cases, (2) abnormal cases, and (3) a small group of five cases, in which total leucocyte counts were made as well as the differential counts.

Twenty-three cases of normal labor were studied with respect to report of the results, but an average of the total figures is given in Table I.

the differential blood counts. Space does not permit of a detailed

Feinblatt and Eggerth¹² give the following figures as normal values for the differential white cell count:

Polymorphonuclear neutrophiles	62.0 to 70.0 per cent
Lymphocytes	20.0 to 30.0 per cent
Large mononuclears and transitionals	4.0 to 8.0 per cent
Eosinophiles	1.0 to 3.0 per cent
Basophiles (mast-cells)	0.2 to 0.6 per cent

By comparing the figures given in Table I with those furnished by Feinblatt and Eggerth, it will be noted that the percentage of neutrophiles rises before labor and stays at a high level during the first day postpartum, gradually subsiding during the puerperium. The small lymphocytes, or small mononuclear cells, decrease in inverse proportion to the polymorphonuclear cells; that is, their percentage drops before delivery and gradually returns to normal during the puerperium. The eosinophiles are markedly diminished just before and after delivery. They do not approach normal values until late

in the puerperal period. At no time were any mast-cells found in any of my 23 normal cases. This is rather a remarkable observation, inasmuch as 400 cells were counted in each instance.

Twenty-seven abnormal obstetric cases were studied, but the findings were not sufficiently consistent to allow of definite conclusions. Of course, when infection is present, the total number of leucocytes and the percentage of polymorphonuclear cells are increased. Normally the eosinophiles do not reappear until several days after labor. In complicated cases, this reappearance may be delayed for several days or longer. With the least rise of temperature or the presence of any complication, the percentage of small lymphocytes is diminished; this change probably results from the increased number and percentage of neutrophiles formed in these conditions. In patients with cracked nipples, a lump in the breast, or slight abdominal tenderness, a slight fall in the small lymphocyte count was not uncommon.

SUMMARY

A study was made of the changes in the differential white blood cell count during labor and the puerperium. My findings in a series of 55 deliveries, 23 of them normal cases, merely serve to corroborate those of earlier investigators, whose work I have summarized in a comprehensive review of the literature. During labor and the first day or two postpartum, there is a moderate grade of leucocytosis, which reaches its peak several hours after delivery. The polymorphonuclear cells are increased both in relative and in absolute numbers. There is a slight percentage decrease in the small lymphocytes, which is usually inversely proportional to the percentage of neutrophiles and regains the normal value at about the same time. The eosinophiles and basophiles are notably absent or greatly diminished during labor. In the absence of complications, the eosinophiles begin to reappear by about the third day of the puerperium. The neutrophiles show a marked shift to the left by the Arneth count and also in Schilling's hemogram.

Except for the established fact that the percentage of polymorphonuclear cells is increased in infections, the differential count would appear to be of little value in labor and the puerperium. It has been observed that the eosinophiles do not appear until several days or more after the third day in complicated cases; that the percentage of lymphocytes is usually still further diminished in the presence of fever or other complications, and that even such slight complications as a cracked nipple, a lump in the breast, or slight tenderness in the abdomen may cause a slight reduction in the percentage of lymphocytes.

REFERENCES

- (1) *Arneth, J.*: Arch. f. Gynäk., 1904, lxxiv, 145. (2) *Idem*: Die qualitative Blutlehre, Leipsic, 1920, vol. 1. (3) *Baer, J. L.*: Surg., Gynec. and Obst., 1916,

- xxiii, 567. (4) *Birnbaum, R.*: Arch. f. Gynäk., 1904, lxxiv, 206. (5) *Blumenthal, R.*: Beitr. z. Geburtsh. u. Gynäk., 1907, xi, 414. (6) *Idem*: Belgique méd., 1908, xv, 159. (7) *Carton, P.*: Ann. de gynéc. et d'obst., 1903, lx, 161. (8) *Chamorro, T. A.*: Semana méd., 1916, xxiii, 33, 57. (9) *Crawford, F. R.*: China Med. Jour., 1924, xxxviii, 199. (10) *Dietrich, H. A.*: Arch. f. Gynäk., 1911, xciv, 383. (11) *Doi, M.*: Arch. f. Gynäk., 1912, xeviii, 136. (12) *Feinblatt, H. M., and Eggerth, A. H.*: Clinical Laboratory Medicine, 1925, New York, William Wood and Co., p. 26. (13) *Fuss, E. M.*: Deutsch. med. Wehnsch., 1922, xlviii, 422; also Ztschr. f. klin. Med., 1923, xciii, 391. (14) *Given, J. C. M.*: Jour. Obst. and Gynec., Brit. Emp., 1906, ix, 261. (15) *Gruner, O. C.*: The Biology of the Blood Cells, New York, 1914. (16) *Habl, C.*: Arch. f. Gynäk., 1902, lxvii, 485. (17) *Haeusermann, E.*: Zentralbl. f. Gynäk., 1927, li, 414. (18) *Hcyn, A.*: Ztschr. f. Geburtsh. u. Gynäk., 1924, lxxxv, 818. (19) *Hibbard, C. M. and White, F. W.*: Jour. Exper. Med., 1898, iii, 369. (20) *Horvath, M. von*: Internat. Cong. Med. Trans., 16th Cong., Sect. 1910, viii, 711. (21) *Jerlov, E.*: Acta gynec., Scandinav., 1923, ii, Part 2, Supp. (22) *Maxwell, J. P. and Yang, M.*: China Med. Jour., 1924, xxxviii, 477. (23) *Morcira, M. V. de S.*: Compt. rend. Soc. de. biol. de Paris, 1926, xcv, 1300. (24) *Pankow, O.*: Ueber das Verhalten der Leukocyten bei gynäkologischen Erkrankungen und während der Geburt, Berlin, 1904, (Jena. Universitaet, Dissertation). (25) *Saidl, J. and Tuma, V.*: Casop. lék. česk., 1924, lxxiii, 213. (26) *Schilling, V.*: Das Blutbild und seine klinische Bedeutung, ed. 3-4, Jena, 1924. (27) *Idem*: Praktische Blutlehre, Jena, Gustav Fischer, 1927. (28) *Sieben, W.*: Beitr. z. Geburtsh. u. Gynäk., 1913-15, xix, 226. (29) *Sommer, K.*: Ztschr. f. Geburtsh. u. Gynäk., 1925, lxxxviii, 658. (30) *Wile, I. S.*: Am. Jour. Surg., 1906, xx, 99. (31) *Würzburger, M.*: Zentralbl. f. Gynäk., 1925, xlix, 1061.

303 WEST ONE HUNDRED AND SIXTH STREET.

DRY LABOR

AN ANALYSIS OF 600 CASES

BY MARGARET SCHULZE, M.D., SAN FRANCISCO, CAL.

(Assistant Professor of Obstetrics and Gynecology, University of California Medical School)

PREMATURE rupture of the membranes is a complication of labor which is very generally feared. A frequent occurrence in dystocia, it has come to be considered in itself a very important cause of dystocia as well as a serious menace to both mother and child from ascending infection. Yet every obstetrician of experience has seen many cases in which rupture of the membranes before the onset of pains was followed by a very rapid easy labor without untoward results for either mother or child.

To determine the true prognostic significance of this complication, the factors resulting in difficulty, and the outcome under various forms of treatment, we have studied the cases of dry labor in a series of 6500 deliveries on the University of California Obstetrical Service. In order to secure as clear a picture as possible of the effects due definitely to the premature rupture, we have included only those cases in which rupture occurred with or before the onset of pains, and have included all such cases no matter how rapidly labor was completed. Our study indicates that an arbitrary time limit, such as that of

twelve hours or more between rupture and delivery, as taken by Dorman and Lyon, may give a false idea of prognosis, since it eliminates a large proportion of patients with premature rupture who complete labor without difficulty in much less than this time, while it includes many patients in whom rupture early in the course of a long labor may be only a minor factor in dystocia due to other causes.

Under our classification are included 604 cases of dry labor occurring after the fetus had reached the age of viability, or 9.3 per cent of the total series.

Etiology.—In considering etiologic factors, we find that primiparity seems to predispose to the condition, as the incidence in primiparae was 12.34 per cent, while in multiparae it was only 7.1 per cent. This confirms a similar observation of Dorman and Lyon.

The age curve of the two types of patients is shown in the accompanying graph. (Fig. 1.)

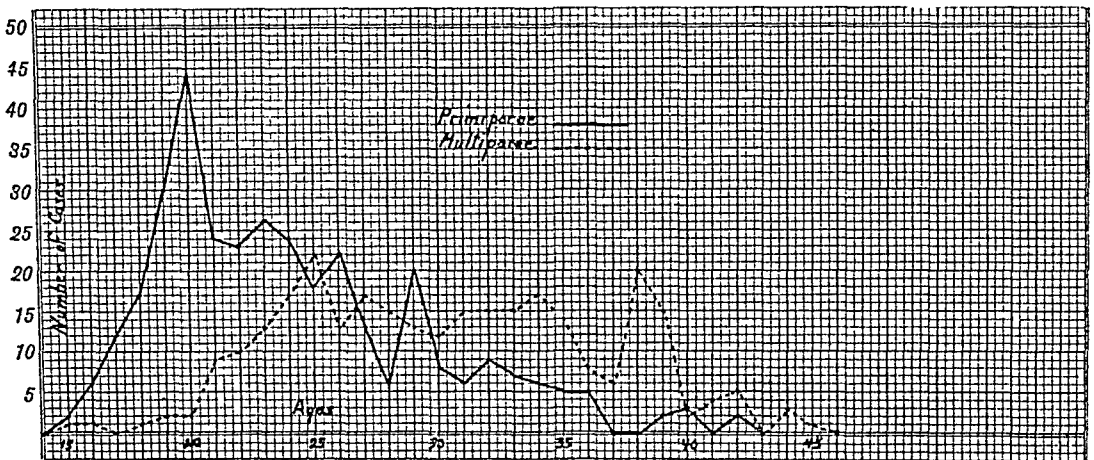


Fig. 1.

The ages of the primiparae varied from fifteen to forty-two years, with a rapid rise in the curve to the greatest number at twenty followed by a rapid fall. The multiparae varied from fifteen to forty-five years, with the greatest number at twenty-five, but with a much more uniform distribution over the various ages. As this corresponds very closely to the average age incidence in the two types of cases, it does not confirm Bassett's contention that the condition occurs most frequently in young primiparae and old multiparae.

Eight per cent of the cases were delivered a month or more before term, and 23 per cent two weeks or more; yet since rupture of the membranes is followed by termination of the pregnancy in a comparatively short time in practically all cases, it is probable that prematurity is a consequence rather than a cause of the premature rupture. The average weight of the children was 3196 gm., considerably below the 3478 gm. average weight in a series at term reported from this clinic by Maxwell.

On the other hand, the proportion of overlarge children and of twin pregnancies was much greater than usual, indicating that overdistention of the uterus may be a causal factor. Eight and six-tenths per cent of the children weighed over 4000 gm., while the average incidence of children of this weight was 4.3 per cent. There were 15 twin pregnancies, or 2.5 per cent, more than three times the incidence in the total series (0.78 per cent).

Although rupture of the membranes early in labor is very frequent in contracted pelves, the condition apparently does not predispose to rupture before the onset of pains, as the incidence of contracted pelves in this series of dry labors was 3.9 per cent—exactly the same as that found by Maxwell in the total series of 6500 cases.

Abnormal presentations, however, were of considerable importance, as breech presentation occurred in 6.1 per cent of the cases, or 7.1 per cent if we include those in twins, while they formed only 2 per cent of the total series. There were 14.2 per cent of occipitoposteriors, while these formed only 10 per cent of the total. There were also 3 transverse and 2 face presentations.

Lack of engagement of the head would seem to be a factor of probable importance, and an attempt was made to determine this point. This was, however, unsatisfactory, as comparatively few of the patients were examined at the time of rupture of the membranes. Thirty-four per cent of the primiparae, and 39 per cent of the multiparae in whom the point is definitely recorded did show a floating head at the time of the first examination. A patulous cervix has been mentioned as a cause, but if this were a factor of much importance, we would expect dry labor to be more common in multiparae than in primiparae, rather than the reverse. It was recorded in a few cases, but as many of the patients entered in labor with partial dilatation of the cervix, it could not be determined in most of them.

In addition to the mechanical factors, or in their absence, variations in tensile strength of the membranes themselves due to changes in their histologic structure are undoubtedly of the greatest importance. A deficient development of the connective tissue layers, particularly the firm subamniotic connective tissue, as described by Niderehe, and in certain cases by Naujoks, seems the most probable explanation, although the various degenerative changes noted by Naujoks may be of importance also. The changes in the amniotic epithelium described by Heinlein are more likely secondary to reduction in size of the amniotic cavity following loss of amniotic fluid and retraction of the uterus. Inflammatory changes in the membranes are described by numerous authors, and were considered by von Franque, Schmidt, and others due to an extension from an endocervicitis or an endometritis, and leading to premature rupture through an increased friability of

the tissues. The frequent occurrence of premature rupture in primiparae, without history or evidence of infection, is a strong argument against this theory, and in the light of recent research by Slemmons and others, it seems more probable that these inflammatory changes are secondary to the premature rupture and due to bacterial invasion of the amniotic cavity in the course of a prolonged dry labor.

Onset of Pains.—Following premature rupture of the membranes, we find that labor pains begin very shortly in the large majority of cases. Two hundred and twenty-four patients developed pains immediately, and an additional 79 within the first hour; that is to say, more than half the patients began labor within an hour after the membranes ruptured. Only 57, or less than 10 per cent, delayed more than twenty-four hours, and of these more than two-thirds were premature. The average weight of the children where pains were delayed for twenty-four hours or more was 2877 gm. In 13 patients, or 2 per cent of the total, pains were delayed more than three days; in 5 for four days; 2 each for five, six, and seven days; 1 for seventeen days, and 1 for nineteen days. Only 2 of these were term children, 1 on the fourth, and one on the sixth day. The patient who delivered in nineteen days was a twenty-one-year-old primipara who was due on August 3. Her membranes ruptured on July 3; she was seen daily in the clinic and showed a profuse drainage but no signs of infection. On July 22, she fell into labor and after ten hours was delivered of a 2750 gm. child. Her puerperium was afebrile and the child did well.

Induction of Labor.—Castor oil and quinine were given to induce labor after the membranes had ruptured in 50 cases. In one case, quinine and strychnine were used; in 2 cases castor oil alone. The medication was started from one-half hour to five days after the time of rupture, and labor was induced in all but 2 of these fifty patients. Pains began in from one quarter of an hour to fifteen hours, the average time being four hours. In one case unsuccessful on first attempt, castor oil and quinine were first given five days after the membranes ruptured, and were followed only by intestinal cramps. Five days later a second attempt was likewise unsuccessful. Six days after this a Watson routine was ordered, and pains began after the second dose of pituitrin. The labor lasted only two hours. The child was a macerated syphilitic premature. In the other case castor oil and quinine were begun twenty-two hours after the rupture of the membranes. No pains followed; twenty hours later a Voorhees bag was inserted and labor began immediately. A live child was delivered spontaneously in ten hours.

Castor oil and quinine were given to induce labor and were followed by premature rupture of the membranes in 29 cases. The interval between the medication and the premature rupture varied from

two to twenty-four hours, the average being nine and four-tenths hours. In 15 cases, labor began immediately; in the remainder in from one to twenty-three hours, the average being ten hours, except in 4 cases. In one of these castor oil and quinine were followed by rupture of the membranes, but there were no pains. Two days later, a second course of castor oil and quinine was given and was followed by pain in one and a half hours. In a second case, rupture of the membranes occurred four hours after the castor oil and quinine, and irregular pains began immediately and continued for two days without accomplishing delivery. A second dose of castor oil and quinine was then given; pains improved in character, and delivery was accomplished in ten hours. The 2 other cases ruptured their membranes after castor oil and quinine and when no pains had developed, a Voorhees bag was inserted seven and nineteen hours respectively after rupture, and pains began immediately.

Castor oil and quinine, or in a few cases the oil alone, was given during labor in 27 cases. In some cases it was given at the beginning of labor when pains were present but slight and indefinite, in others during the course of a long labor with poor pains, in the hope of stimulating contractions. The results were more satisfactory in the former type of case, and a number developed strong contractions and completed labor promptly.

In view of much recent discussion of possible injurious effects of quinine upon the fetus, it is interesting to note that quinine had been used in only 3 cases in which the fetus was stillborn. As one of these was an anencephalic child, another a macerated premature which showed definite anatomic lesions of syphilis and a luetic placenta, and the third, a severe dystocia in which a destructive operation was finally necessary, it does not appear that the quinine could have been in any way responsible for any of the fetal deaths.

Voorhees bags were used in 19 cases. The indications and the influence of bag treatment upon prognosis for mother and child we shall defer until we have discussed the prognosis in general.

Length of Labor.—Our first study was upon the length of labor. We found that in primiparae the average duration of the first stage in dry labor was twelve and one-tenth hours, while Williams estimates the average in all first labors as sixteen hours. For multiparae, the average was seven and one-tenth hours, while Williams' average is eleven hours. Apparently, then, the first stage of labor is shortened rather than lengthened by the absence of the membranes. In a rather high proportion of cases, the first stage was very markedly shortened, for 37 per cent of the primiparae and 64 per cent of the multiparae had a first stage of six hours or less. Cases in which pains were delayed for twenty-four hours or more, though we might expect longer labors because of lessened irritability of the uterus, showed an aver-

age of eleven hours in primiparae, with 32 per cent under six hours, and an average of six and five-tenths hours with 63 per cent under six hours in multiparae.

The second stage showed little difference from the usual average; in primiparae it averaged one and eighty-two hundredths hours, in multiparae nine-tenths of an hour.

The pains in the cases of short labor were usually strong and frequent. In 82 per cent of the dry labors pains were recorded as strong and effective, while in 18 per cent they were only fair or even poor in quality.

In 51 of these cases, or 8.4 per cent, labor lasted over twenty-four hours. Slemons, in this clinic in 1915, found 12.4 per cent of 500 consecutive labors lasting over twenty-four hours. Horner, in his study of 500 cases of bradytocia, reported from the Chicago Lying-In Hospital, found 11 per cent of 4521 cases thus prolonged. That is, contrary to the general opinion; not only is the average duration of labor in these cases with premature rupture of the membranes considerably less than usual, but also the proportion of cases showing prolonged labor is decreased. Moreover, in a high proportion of the cases of prolonged labor, we found one or more additional factors which might have contributed to the prolongation; thus 39 of these cases were in primiparae and of these, 6 were over thirty years of age; 21 had abnormal presentations; of these, 1 was a transverse presentation, 8 were breech, and 12 were occipitoposteriors. Four had contracted pelves and 7 had babies weighing over 4000 gm.

Operative Interventions.—Notwithstanding the relative shortness of the dry labors, we found that an operative termination was necessary in a rather high percentage of cases. There were 43 breech extractions, or 7.1 per cent; in the total 6500 cases there were 2 per cent. There were 49 deliveries by low forceps, or 8.1 per cent, while the total series showed 5.8 per cent. Since the breech extractions would have been necessary regardless of the premature ruptures, and lifting the head over the perineum with low forceps may be regarded as a potentially normal delivery, we shall concern ourselves more particularly with the other operative procedures.

Of these, we found 25 midforceps, or 4.1 per cent; 9 high forceps, or 1.4 per cent, 1 pubiotomy and high forceps, 2 versions and extractions, 2 unsuccessful attempts at high forceps, the one delivered by craniotomy, the other by Porro cesarean section. One neglected transverse presentation was delivered by decapitation and brachiotomy. That is, 40, or 6.6 per cent, of the cases developed dystocia, requiring serious operative intervention. When we analyze these cases, however, we find, as we did with prolonged labor, a high percentage of additional factors commonly recognized as causative factors in dys-

tocia. Thus 24, or 60 per cent, showed abnormal presentations, of which there were 20 occipitoposteriors, 3 transverse and 1 face presentation. In addition there were 6 contracted pelves, 4 associated with posterior positions, and 3 overlarge babies, 2 in occipitoposterior positions. In other words, more than two-thirds of the cases requiring operative intervention for dystocia showed one or more causes for dystocia aside from the dry labor.

In addition to the operative terminations, we find a number of other operative procedures. The completion of the dilatation of the cervix with the hands, which we might believe necessary frequently, due to loss of the dilating action of the membranes, was used only four times, about half as frequently as in the total series. Cervical lacerations of sufficient severity to necessitate immediate suture were not recorded, hence, apparently, lack of the membranes does not predispose to deep laceration. This confirms a similar observation of Wijnenbeek. Manual rotation of the head in an occipitoposterior position, followed by spontaneous delivery was done in one case. The placenta was removed manually four times. One third degree tear occurred which was repaired.

Since this study was concerned primarily with the influence of premature rupture on the course of labor and its prognosis, we have not included in the series the cases of cesarean section performed for compelling and predetermined indications in spite of the early rupture. Of these, there were 12 during this period of time, with a maternal mortality of 2, or 16 per cent, and no fetal mortality. All except one, a Porro operation, were classic cesareans, so the series confirms the prevailing opinion of the danger of the classic operation after the rupture of the membranes. At the present time, a cervical cesarean would be performed when necessary under these circumstances.

Maternal Mortality.—There was no maternal mortality in the series of 604 dry labors.

Fetal Mortality.—The fetal mortality was 30 cases, or 5 per cent, including stillbirths and deaths in the first two weeks after birth. We have considered viable children weighing over 1500 gm., the standard taken by Williams in his study of fetal deaths in a series of 10,000 cases in Johns Hopkins Hospital. As the mortality in Williams' series was 7 per cent, and that in a similar series reported by Holt from Sloane Maternity was 7.2 per cent, it is apparent that the danger to the child is not increased by dry labor. Nineteen of the cases were still-born; 11 died in the first two weeks of life. The mortality at birth and in the first twelve hours was 23, or 3.8 per cent, practically the same as McQuarrie's mortality of 3.6 per cent in a comparable period in the first 2700 cases in our clinic.

One child was anencephalic. Two macerated children showed anatomic lesions of syphilis and a luetic placenta. A third macerated

child was not autopsied, but the placenta was not luetic. The membranes had been ruptured for a week, and there was intrapartum fever, hence death was probably due to an ascending infection. In 2 cases, death was due to hemorrhage, once from a premature separation of the placenta, once from rupture of a velamentous cord vessel. In 2 cases death was due to prolapse of the cord, a mortality of 40 per cent in the 5 prolapsed cord cases. This is practically the same mortality rate as found in the prolapsed cord cases in the 6500 patients (38 per cent), although the incidence of this complication was twice as high in the dry labors. Three premature children died within a short time after birth. One child of a most uncleanly mother developed bullous impetigo and died on the ninth day after birth. In 15 cases, or 50 per cent, there was definite birth trauma—difficult breech extractions, forceps, or other operative deliveries. One of these was a very long but spontaneous delivery in an elderly primipara. In 3 of the cases no cause for death was evident, in 2 of these even after postmortem examination of the child.

Inflammatory reactions in the cord were noted in 6, or 31 per cent, of the 19 fatal cases in which microscopic examinations of the cord were made. Hence, an ascending infection through the cord vessels must be considered as a cause of death in all of these cases. Yet since 4 of these were operative deliveries, 1 was a markedly prolonged spontaneous labor and the other a premature, it is difficult to weigh fairly the various factors. In one patient with neglected transverse presentation who entered the hospital with a temperature of 38.3° C. after two days labor, the fetus was dead before operative delivery was attempted, and the death may fairly be ascribed to infection. In another, a child in fairly good condition at birth, after a midforceps operation undertaken for maternal exhaustion in a prolonged labor, died on the fourth day with a temperature of 40° C. The prolonged spontaneous labor was afebrile, the patient was not examined vaginally, and the postmortem examination of the child was negative. In the other fatal cases with cord inflammations, it seems impossible to decide between infection and the traumatic factors or prematurity.

As in the prolonged labors and the dystocias, we found so many additional abnormal conditions which might have helped account for them, it is interesting to analyze the cases of fetal death from this standpoint. Here also we find 17 abnormal presentations, or 57 per cent of the fetal deaths; 10 were occipitoposterior, 5 breech, and 2 transverse. Six, or 20 per cent, had contracted pelves. In 20 cases, or 66 per cent, operative delivery had been necessary.

By way of contrast, we find that in 409 dry labors in occipitoanterior positions in normal pelves, where the fetus weighed over 2500 gm. the fetal mortality was only 1.2 per cent. This confirms the conclusions of Brodhead. drawn from a singularly uncomplicated series of 182

private cases of dry labor that, in the absence of abnormal conditions, such as contracted pelvis, large child, malpresentations, etc., premature rupture of the membranes is not attended by harmful results for either mother or child.

Maternal Morbidity.—Although there were no maternal deaths in the dry labor cases, we found that maternal morbidity was somewhat greater than the normal. In the total series of 6500 patients, 13.5 per cent had febrile puerperia, including all patients who had a fever over 38° C. even once. Eliminating the cases in which fever was clearly due to mastitis, respiratory infections, etc., the corrected morbidity was 12.8 per cent. In dry labors, the total morbidity was 17 per cent. The corrected morbidity was 15.9 per cent. For the nonoperative cases it was 14.4 per cent, for the operative ones, 22 per cent. Bag labors showed practically the same morbidity as other operative cases; namely, 21 per cent. The morbidity in all cases where the membranes had been ruptured over twenty-four hours was 17.8 per cent. In the cases in which labor was prolonged over twenty-four hours, the morbidity was extremely high—37.2 per cent. Uterine cultures were made as a routine in febrile cases and showed organisms in practically all cases except where the fever was clearly due to an extrapelvic cause.

Fever (38° C. or more) during labor was noted in 15 cases, probably less than the actual incidence, since the temperature during labor was not always recorded. Five of these patients delivered spontaneously; 10 required operative deliveries. In 6 of these patients the puerperium was febrile also. Four patients showed inflammation of the cord; of these, 2 children died and 2 lived. Two children showing no cord inflammation died also, probably from birth trauma.

Omphalitis.—Since Slemons has emphasized the danger to the child from placental bacteremia and Creadick and later Siddall have shown that the inflammatory lesions in the cord formerly ascribed to syphilis are actually due to an ascending bacterial infection from the amniotic cavity, it is interesting to see in what proportion of dry labors we find evidence of such ascending infection. In the earlier cases, microscopic studies of the cord were not made. In 408 of our 604 cases, we find 21 showing a definite omphalitis. This is over twice the percentage found in our own total series and also by Creadick, though much less than that found by Siddall. Sixty-six per cent of the omphalitis cases had had operative deliveries, and in 66 per cent the membranes were ruptured over twenty-four hours before delivery. In five cases, or 23 per cent, the labor itself was over twenty-four hours in length. Of the spontaneous deliveries there was only one in which labor was completed within twenty-four hours of the rupture. A normal spontaneous delivery in dry labor, therefore, seems to carry very little risk of ascending infection, but it is only when labor is prolonged or

the necessity of operative intervention requires invasion of the amniotic cavity that the risk is great. Only 4 of the mothers showed an intrapartum temperature over 38° C. though 15 were over 37.5° C. The puerperal morbidity was 6, or 28 per cent. The fetal mortality was likewise 6, or 28 per cent, but in several of these cases it seemed impossible to decide whether infection or trauma was the most important factor, as is found in our earlier discussion of fetal death in dry labor.

Complicated Dry Labors.—Since uncomplicated dry labors give so little difficulty, whereas contracted pelves, breech deliveries, occipitoposteriors and other complicating factors add so much to the danger in dry labors, the question arises whether the reverse holds true and how much premature rupture of the membranes adds to the danger in these abnormal labors. In breech labors, we find a high proportion, 18.6 per cent, prolonged over twenty-four hours. The fetal mortality was 11.6 per cent, slightly higher than the usual mortality. The maternal morbidity was 16.3 per cent, higher than that in spontaneous dry labors but less than in other operative cases.

The 3 transverse presentations are too few to draw conclusions, but in 2 the children were stillborn, in 1 the labor was over twenty-four hours, and in this one both labor and puerperium were febrile.

Fourteen per cent of the patients with occipitoposterior presentations had labors lasting over twenty-four hours; 36 per cent required operative deliveries, and the fetal mortality was 11 per cent, while the operative incidence in Bell's 510 cases from this clinic was 38 per cent and the total fetal mortality, 6.7 per cent. The maternal morbidity was 17.4 per cent.

Contracted pelves showed 16 per cent of labors prolonged over twenty-four hours, an operative incidence of 41 per cent (Maxwell found 55 per cent in all contracted pelves). The fetal mortality was 25 per cent, while Maxwell found 9.9 per cent in all. The maternal morbidity was 27 per cent.

In abnormal labor, then, the danger, particularly the danger to the child, is definitely increased by premature rupture of the membranes, and this probably explains the fear in which dry labor in general is held, since it is the cases which cause difficulty which remain in mind, and it is easy to ascribe the difficulty to some such obvious factor as the premature rupture.

Treatment by Voorhees Bags.—Treatment by Voorhees bags remains for discussion. It is recommended by some authorities when pains do not set in within two or three days of rupture, and also in the course of labor when cervical dilatation does not progress normally. Our series of bag cases is small, since bags were rarely used for induction of labor in uncomplicated cases. There were 18 in all, 10 inductions;

4 of these were complicated by abnormal presentations, 5 cases where the bag was used in the course of a labor with poor pains and slow dilatation, and 4 cases where the indication did not depend upon the dry labor (2 premature separations and 2 toxemias). The results as they stand are very poor, 47 per cent operative terminations, 31 per cent fetal mortality, 10 per cent intrapartum fevers, 21 per cent puerperal morbidity. Yet none of the fetal deaths were in uncomplicated cases. Two were markedly premature, one of these a breech, the other a transverse presentation. One overlarge child (5075 gm.) died during a difficult breech extraction. The children of 2 patients entering labor with an unengaged head in R.O.P., one of these in a contracted pelvis, succumbed to operative trauma. In one of the premature separations, the child was dead when the patient was first seen.

Used in the course of a long labor which was not progressing normally, the bag completed cervical dilatation in from two to nine hours in 4 cases. Maternal exhaustion necessitated high forceps in 2, and of these, 1 child succumbed. In 1 other case, the bag excited tetanic contractions and had to be removed. The cervix was dilated manually and a normal delivery followed.

Even in the uncomplicated cases, although the children were all born alive, the maternal morbidity was 33 per cent.

Since in all the patients with membranes ruptured over twenty-four hours before labor started, the fetal mortality was 7.1 per cent, with most of the deaths incident to the usual prematurity of such children, and the maternal morbidity 17.8 per cent, it appears that the results with bag induction are far worse than if the case is allowed to continue without operative intervention. Although the series of bag cases was too small for sweeping conclusions, and the bad results were often due to other causes than the bag, it certainly does not encourage the hope that either fetal mortality or maternal morbidity can be reduced by the use of bags.

CONCLUSIONS

1. Dry labor occurred in approximately 10 per cent of 6500 cases.
2. Predisposing factors are primiparity, overdistention of the uterus, as by large children or twins, abnormal presentations, and lack of engagement of the head. The determining factor appears to be a lack of tensile strength in the membranes, probably due to a deficient development of the connective tissue layers. Many of the labors are premature, but this is probably a consequence rather than a cause.
3. Labor begins in twenty-four hours or less in 90 per cent of cases; of those delaying longer, two-thirds are premature. The longest delay was nineteen days.

4. Castor oil and quinine were successful in inducing labor in over 90 per cent of the cases in which they were used. No fetal deaths could be attributed to the quinine.

5. The average length of the first stage of labor was considerably shorter than that usually accepted for normal in both multiparae and primiparae. One-third of the primiparae and two-thirds of the multiparae had very short first stages—six hours or less. The second stage was not influenced.

6. Labors prolonged over twenty-four hours were less frequent than reported in unselected series. Dry labors which were prolonged and also the cases of dry labor developing dystocia requiring serious operative interventions, showed other abnormalities, as malpresentations, contracted pelves, overlarge children, etc., in a high percentage of cases.

7. Fetal mortality was not higher than normal and a high percentage of the fetal deaths occurred in uncomplicated cases.

8. There was no maternal mortality in 600 cases. Maternal morbidity was slightly higher than that found in our 6500 unselected cases.

9. Cord inflammations were twice as frequent as found in our 6500 cases, but occurred almost entirely in prolonged labors or in operative cases.

10. In abnormal labors, as those complicated by contracted pelves, malpresentations, etc., the fetal risk is considerably increased by premature rupture of the membranes. The maternal risk as measured by maternal morbidity is also increased slightly. This may explain the bad repute of dry labor in general, since it is the cases which cause difficulty which remain in mind, and it is easy to ascribe the difficulty to some such obvious factor as the premature rupture.

11. Results with bag treatment were very poor, and, although the series was small and the bad results often due to other causes than the bag, offer little hope of reduction either of fetal mortality or maternal morbidity.

REFERENCES

- Williams*: Obstetrics, New York, D. Appleton and Company. *Dorman and Lyon*: AM. J. OBST. & GYNEC. 1: 595, 1921. *Basset*: Ztschr. f. Geburtsh. u. Gynäk. 73: 566, 1913. *Maxwell*: Am. J. Obst. 80: 497, 1919; idem: J. A. M. A. 89: 2088, 1927. *Niderehe*: Ztschr. f. Geburtsh. u. Gynäk. 86: 612, 1923. *Naujoks*: Ztschr. f. Geburtsh. u. Gynäk. 84: 304, 1921. *Heinlein*: Monatschr. f. Geburtsh. u. Gynäk. 56: 237, 1922. *Schmidt*: Monatschr. f. Geburtsh. u. Gynäk. 51: 1, 1920. *Williams*: J. A. M. A. 64: 95, 1915. *Holt*: J. A. M. A. 54: 287, 1915. *McQuarrie*: J. A. M. A. 73: 1574, 1919. *Slemons*: J. A. M. A. 64: 1265, 1915; idem: Am. J. Obst. 78: 321, 1918. *Creadick*: Surg. Gynec. Obst. 30: 278, 1920. *Siddall*: AM. J. OBST. & GYNEC. 14: 192, 1927. *Horner*: Surg. Gynec. & Obst. 44: 194, 1927. *Brodhead*: New York State J. Med. 24: 801, 1924. *Wijsenbeck*: Nederl. Tijdschr. v. Verlosk. en Gynaec. 28: 34, 1922.

A REVIEW OF THE PATHOLOGY OF ONE HUNDRED FOUR CONSECUTIVE MISCARRIAGES IN PRIVATE OBSTETRIC PRACTICE*

BY JAMES LINCOLN HUNTINGTON, M.D., F.A.C.S., BOSTON, MASS.

IN APRIL, 1922, I reported before the Obstetrical Section of the New York State Medical Society 39 consecutive abortions in which the products of conception had been carefully studied. Since then my series has increased to 104 consecutive intrauterine pregnancies which terminated or were interrupted before the period of viability. All of these, with one exception, have been examined by Dr. George L. Streeter of the Carnegie Institute of Baltimore and through his kindness and help it has been possible to make the following report.

Eighty-five were inevitable abortions in that the tissues were dead before the uterus was emptied.

Let us first dispose of the other 19 abortions in which the products of conception were living at the time of the termination of pregnancy. Ten of these were artificially terminated as follows: 2 came into my office after criminal methods had been employed; 6 were therapeutic abortions; and in the remaining 2 the uterus was emptied because of hemorrhage due to placenta previa. Of the 9 remaining in this group, 2 abortions immediately followed trauma sufficiently violent to rupture the amniotic sac; 1 was immediately after appendectomy with drainage. These last 3 patients have all been pregnant two or three times since the above events, have had no abortions, and the children have been healthy and strong.

The remaining 6 will have to be taken up separately.

Patient No. 1593. This patient has a history of 2 previous abortions at four months and two and a half months respectively. Further details of these are lacking. Both parents of the patient had syphilis but repeated tests of the patient's blood have all been negative. The patient has a history of definite pelvic infection and has had two severe attacks of salpingitis, one before and one a few months after this abortion which was at eighteen and a half weeks and spontaneous. Streeter wrote after studying the products of conception: "From an examination of the placenta it is my impression that the growth of the villi is not as luxuriant as is usually found in fetuses of this size, but the villi are normal and show none of the changes we usually associate with syphilis."

Three patients were responsible for the remaining 5 abortions in this group and all of these seem to fall into one class.

The first patient, No. 1288, aborted at twenty weeks. The report from Dr. Streeter was: "A male fetus and placenta, both of which appear normal, as

*Read at a meeting of the New York Obstetrical Society, May 2, 1922.

that we may be sure that development was in progress a very short time before the miscarriage." The history leading up to this is as follows: Her first pregnancy, when twenty-six years of age, terminated with toxemia, manual dilatation and delivery at seven months of a 2 pound 6 ounce baby which lived two days. The following year she had an abortion at four months. Again a year or so later she had an abortion at three months and the following year an abortion at five months. The patient was badly torn at her first delivery and was repaired in 1918. The patient was two months along in her fifth pregnancy when I first saw her. She had a very slight showing about the time she skipped her first period. There was no sign of toxemia. She was kept very quiet in bed, gradually allowed to walk around the room and after five months was walking up the stairs once a day. She began to have indefinite pain September 30, 1920, and was sent at once to the hospital. After twenty-four hours she suddenly started in active labor and delivered herself of a 5 pound 6 ounce female child, estimated to be about four weeks premature. The baby did perfectly and is alive and well today. The patient started her next pregnancy October 21, 1921. She was kept very quiet as before. In spite of this the patient started in labor on May 13 and delivered herself of a very small male baby that lived but thirty minutes, estimated to be eleven weeks premature. With the present pregnancy which ended in abortion, the patient was kept practically in bed. She had two slight attacks of bleeding after straining at stool. The membranes ruptured while the patient was lying quietly in bed and she aborted spontaneously shortly afterwards.

Thus we have here a patient who, following toxemia in her first pregnancy, has had six pregnancies terminate before term, and in only one case was a child capable of surviving obtained. This patient had a negative Wassermann, and physical examination in 1925 failed to show any apparent cause for these abortions. Her blood pressure always was low and she never showed anything abnormal in the urinalyses.

The second patient, No. 1301, had an abortion at seventeen weeks in May, 1920, and again at eighteen weeks in November, 1920. Both of these were reported as living up to the time the uterus was emptied and were considered absolutely normal by Streeter. The past history of this patient was as follows: With her first pregnancy seven years before her first abortion she had toxemia. The uterus was emptied at seven months and the baby did not live. Shortly after this the patient developed a condition closely resembling epilepsy, supposed to be due to intestinal toxemia. To ameliorate this condition the appendix and ascending colon were removed some three years before her second pregnancy. This began December 28, 1919, and I saw her first in April, 1920. Except for slight bleeding on March 23, the pregnancy had been proceeding normally. On April 30, she ran a few steps to catch a train, shortly afterward had a gush of fluid and aborted the next day. As I say, Streeter reported normal living tissue at the time of abortion. Her third pregnancy began July 1, 1920. The patient was kept very quiet and on luminal to prevent any epileptiform attacks. On the twelfth of November the patient was very apprehensive, feeling that an attack was coming on. She was sent to the hospital and given chloral. She had several attacks of twitching that day, a bloody discharge was noted that night and she aborted the next day. Streeter again found all normal. The patient had a complete physical examination at this time. The Wassermann was negative and no renal condition could be found to account for the abortion. The next pregnancy began March 2, 1922. The patient was kept in bed and given opium suppositories

whenever she felt any sensation of pelvic congestion. Toward the end of pregnancy the patient had a slightly elevated blood pressure, once as high as 136. The urine occasionally showed the slightest possible trace of albumin, no blood or casts. The patient ruptured her membranes when within two weeks of term and had a 6 pound 2 ounce male infant, which has done perfectly well since birth. The next pregnancy started September 4, 1923. She was kept in bed during the first seven and one-half months, then given more and more freedom the last six weeks. The patient went to term and delivered normally a seven and a half pound male baby which has done perfectly well since. She showed no symptoms of toxemia at all with this last pregnancy. That adhesions in the pelvis from the previous laparotomy may have caused these two abortions has to be entertained as a possibility.

The third patient was a primipara, eighteen years old. The pregnancy was proceeding normally when the patient, then about twenty-one weeks pregnant, fell from a sleigh into a snow drift, shortly afterward began to have a discharge and aborted spontaneously. The fetus was alive at the time it was born but was not examined by Dr. Streeter. Her next pregnancy began June 1, 1921. The patient was urged to keep moderately quiet but was not kept in bed. On November 8 she began to have a bloody discharge and aborted the next day. The products of conception were sent to Dr. Streeter, who reported normal living tissue up to the time of abortion. Complete examination, including Wassermann, failed to show anything abnormal. Since these events I have learned that this patient has had two more pregnancies, has remained practically in bed during each pregnancy and has two living healthy children.

So much for the 17 patients, 19 of whose pregnancies ended before the period of viability with normal living tissues at the time of abortion. In none of these cases was there any history or evidence of endometritis and in none of these cases was there any uterine displacement.

We come now to the 85 pregnancies in which development had ceased before the expulsion of the products of conception, and all in or before the twentieth week.

In 3 of these abortions the tissues were normal and little or no maceration had taken place but development had ceased days or weeks before expulsion. The first one was in a patient with multiple fibroids who had been bleeding every day for many weeks. A hysterectomy was done and a fetus was found in utero. Streeter reported maceration in the cord and the placenta; he estimated the development as twenty weeks and that fetal death had taken place four weeks before the hysterectomy. Here apparently the etiologic factor was the fibroid growth of the uterus. Pierson¹ studied a series of 191 patients at the Sloane Hospital which showed, clinically important, fibromyomas. He found that spontaneous abortion or premature labor occurred in 24.1 per cent of these.

The second in this series of three abortions is as follows:

It was her sixth pregnancy. There was nothing remarkable in the history of her first three and the children are living and well. The fourth ended in an operation for central placenta previa, sixty-nine days before term. The baby

lived but ten hours. The fifth pregnancy ended in an abortion at eleven weeks. Streeter reported an ovum of four weeks' development and a diagnosis of defective germ plasm. Following this the patient was curetted by a leading gynecologist and the cervix repaired. "Curettings showed a mild polypoid gland hypertrophy." The patient had increasing anemia before and after this operation and had a sharp attack of pyelitis. She was in very poor physical condition when the sixth pregnancy began, January 22, 1923. Dr. George Minot was taking care of the patient, trying to improve her blood condition. On June 2, without any trauma or undue exertion, the patient noticed a slight watery discharge from the vagina. Later in the day this became blood tinged. The next day the patient began to have considerable discomfort and on June 4 after two or three cramp-like pains, presented an intact bag of membranes at the vulva. The uterus was emptied with only very moderate bleeding, but the patient continued to ooze until packed. Later in the day the patient was transfused because of profound anemia. The products of conception in this case are described by Dr. Streeter as follows: "A female fetus, normal in form and shows no evidence of maceration. From its weight and measurements it has a development of a little over eighteen weeks, whereas the menstrual age is twenty-two weeks. I think we must conclude that the fetus was dead three or four weeks before the expulsion occurred. The placenta on section shows no abnormality other than slight maceration. I imagine the clinical history of anemia and other functional disturbance produced this effect on the ovary rather than on the embryo after development had been inaugurated." The patient has had one pregnancy since, in 1925, which again terminated in central placenta previa five weeks before term. The baby weighed five pounds and has done perfectly well.

The third patient in this series, after one and one-half years of sterility, had a dilatation and curettage. The curettings showed "polypoid and hypertrophied endometrium." The patient had one period following the operation and immediately became pregnant. She had long continued and at times fairly profuse bleeding during the second and third months of pregnancy but with rest in bed the pregnancy continued and a full-term nine pound male child was easily delivered by low forceps. The child is well and strong today. Following this pregnancy, after two years and three months, the patient again had a dilatation and curettage, the curettings this time proving normal. At this time a laparotomy was performed and the right ovary, being completely replaced by multiple follicular cysts, was removed and the uterus was suspended by the round ligaments. After this operation, over a year elapsed before another pregnancy occurred. Because of previous bleeding the patient was kept very quiet during the early months, but in spite of these precautions the patient began to have a slight bloody discharge when about four months pregnant and ten days later aborted. Dr. Streeter reports as follows: "Male fetus, normal, eighteen weeks development, has been dead for two weeks." He suggested that this abortion might be due to a faulty hormone reaction. It is interesting to note in this connection that the fetus was a male, in view of the work of Oscar Riddle² at Cold Spring Harbor. The patient and her husband were thoroughly examined following this miscarriage and nothing abnormal found in either, except that the patient herself had a blood pressure of 85/45 and a basal metabolism of -5. She was therefore put on small doses of thyroid, $\frac{1}{2}$ gr. t.i.d. After four normal monthly periods the patient became pregnant. During pregnancy the doses of thyroid extract were gradually increased so that she was getting two and one-half grains daily the last few weeks. The patient was kept moderately quiet the early months of pregnancy because of her history. Everything was perfectly normal, however, and on the twenty-ninth of

last March she delivered herself normally of a 7½ pound female infant. The child is perfectly healthy and growing most satisfactorily.

It does not seem as if endometritis or uterine displacement could have played any rôle in these abortions.

This brings us to the 82 abortions remaining, all considered due to defective germ plasm.

What is defective germ plasm?

Vignes,³ has written a long theoretical discussion of the causes of abortion. He considers the possibility of irregular menstruations being very early abortions, that is, where the period is delayed two days to over a week. He also considers the possibility if not the probability of complete resorption of these early defective embryos in man. He goes on to say that every egg is not capable of fertilization and so of course every abortion is not pathologic. There is variation in fertility among the different races and it is possible that some individuals may be biologically incompatible.

Streeter⁴ thus describes "defective germ plasm": "It must be understood that the term is used on the basis of behavior rather than on microscopic appearance. The defective egg is one that does not develop properly. If one had a defective egg alongside of a virile egg it is not likely that they would present any particular differences in appearance. It is the way they react in the mechanism of development that distinguishes the two. * * * One is prepared to make the diagnosis of defective germ plasm on the basis of failure in development rather than in any characteristic histologic differences in tissue."

Rock⁵ states that most spontaneous abortions in human beings are due to intrinsic disturbance in the fertilized ovum or in the maternal organism and not to the traditional extrinsic environmental accidents to the mother. He further considers that the causes of sterility and abortion are probably in large part identical, the two conditions being but different degrees of diminished fertility.

Macomber⁶ discusses fully the etiologic importance of defective germ plasm and finds that his sterility patients give a history of twice as many abortions as have the average patients.

Williams⁷ in the 1926 edition of his textbook states that "one of the most usual causes of death of the fetus is to be found in the abnormalities of development which are inconsistent with life."

So much for the literature; sufficient to state that few authors refer to the rôle of defective germ plasm in abortion, and practically none emphasize the importance of routine examination of the products of conception. And, yet, we have 82 abortions out of 104 where the unqualified diagnosis was defective germ plasm.

Let us take up the 82 abortions where this diagnosis was made by Dr. Streeter and see if we can learn anything from a close analysis.

In 8 of these abortions the patients were primiparae. There is no history of subsequent pregnancy. One at least of these patients had been under treatment for sterility for several years. Two of these patients showed retroversion of the uterus and a third had endometritis.

Let us now turn to the chart.

TABLE I

PATIENTS	ABORTIONS	REPORTED D. G. P.	LIVING NORMAL CHILDREN	DEAD CHILDREN OR STILLBIRTHS	RETRODISPLACE- MENTS OF UTERUS OR ENDOMETRITIS
33	33	33	I 68 (2.06)	5	7
28	68	41	II 52 (1.86)	9	7
28	2	0	III 75 (2.68)	4	13

The next 33 abortions occurred in multiparae who have had only one abortion each, and that one studied by Streeter. As far as fertility is concerned we find that these 33 patients have had 68 living, healthy, normal children and 5 stillbirths or children who have died shortly after birth. This would give 2.06 living children per patient. It is interesting to note that only 7 of these 33 patients showed evidence of either endometritis or uterine displacements.

Twenty-eight patients were responsible for the 41 remaining abortions. Each gave a history of 2 or more abortions, 68 abortions in all. In my previous paper^s I reported an incidence of miscarriage of about 1 in 10 pregnancies. I have found that practically the same ratio exists in this larger series. So if 1 pregnancy in every 10 ends in abortion it is obvious that these 28 patients have had more abortions than they were entitled to and in so far must be regarded as pathologic.

In comparing the series of multiparae who have had only one abortion with these, we find that the former series is distinctly more fertile, 2.06 living children as compared with 1.88 in the latter series. As a checkup I took the last 28 multiparae I had delivered, not in this series, and I found that the number of living children was 2.66. It is also interesting to note how the stillbirths and neonatal mortality varied in these groups, 5 in the first group, 9 in the second, and 4 in the third. Obviously the number of cases is far too small to allow of any such inference being drawn, but it certainly suggests a tendency to more virile germ plasma in the latter group where abortions were practically absent. Also it can be seen that there seems to be no connection between uterine displacements and abortions in these series, for in the group with 68 abortions only 7 out of 28 patients gave evidence of uterine displacement or endometritis while in the group with 33 abortions, 7 out of the 33 gave such evidence and in the group with only 2 abortions, 13 of the 28 women had uterine displacements and several of these had slight endometritis as well.

Now to return to this interesting group of 28 patients who have had 2 or more abortions each, I am taking only the 10 cases that have had careful study of the products of conception. Several of the other 18 cases in this series might prove equally or more interesting, but as I have had the opportunity of seeing the products of only one of the

TABLE II

PATIENT'S NO.	AGE AT 1ST CONCEP- TION	ABORTIONS	LIVING CHILDREN	DEAD OR STILL- BORN	PELVIC LESION	HEALTH		? OF RESORPTION
						HUSBAND	PATIENT	
555	26	2	3	0	Retroversion	Not examined	Excellent	0
1863	26	3	1	0	Retroversion	Perfect	Hypothyroidism; B.M. -17	X
873	28	2	4	0	0	Not strong	Normal	0
1541	31	2	1	0	Multiple fibroids. Op. 1925	Perfect	Hypothyroidism	X
1352	23	2	1	1	0	Obese	Normal	X
1124	24	3	4	0	Endocervicitis	Focal infection	Focal infection; B.M. -21	X
1229	28	2	0	1	0	Not examined	Normal	0
1318	25	3	1	1	0	Obese and has hy- pertension	Normal	0
1383	26	3	2	1	0	Lowered resistance for years. Py- elitis, ill 3 mo. 1926	Normal; B.M. +5	0

abortions per patient and sending that to Dr. Streeter for examination I feel we had better select for more careful study these other 10 where the story is more fully known.

The first of these 10 is a patient who has chronic nephritis, and has had four abortions. The first and fourth only were in our care and studied by Dr. Streeter but the other two were apparently similar from the story. They were all spontaneous and showed fibrous degeneration of the decidua and were retained for several weeks after development had ceased.

Of the remaining 9 patients 5 had 1 pregnancy each before coming to me for care. The other 4 have been patients of mine since the beginning of their obstetric history.

All these patients at the time of the first abortion were over twenty-four and under thirty-two years of age. Four of these patients have had 3 abortions and the others 2 each. Dr. Streeter has of course examined all of these, compared the products of conception with the previous slides and, I again emphasize, in every case his decision has been defective germ plasm. Most if not all of these showed marked hydatiform degeneration of the villi as well as maceration. All of these patients save one have had at least one living child and I know that in that case definite precautions have been taken to prevent the possibility of conception.

While I know that it is most important, as a matter of fact it is a very difficult thing in private practice to insist on complete physical examination of husband and wife after an abortion. In spite of this most of these husbands have had physical examinations and several of the 9 were found to be below standard. Two were 'obese and two are seldom really strong. One has had several teeth removed because of focal infection since the date of his wife's last abortion. Several work altogether too hard, their habits are none too good and it is within the realms of possibility that some of them may be responsible for the defective germ plasm. Two husbands only have been examined thoroughly and both of these had perfectly normal active spermatozoa in ample quantities.

Four of the above mothers have had their basal metabolisms studied. In 3 it was negative. One of these patients with negative basal metabolism and a history of 2 abortions was put on thyroid extract, about 5 to 10 grains daily. While taking thyroid she became pregnant, went successfully to term and now has a splendid healthy infant. Two and a half years previously she had a laparotomy improving a slightly retrocessed uterus and several small fibroids were removed. No pregnancy took place, however, until she started taking thyroid extract.

Five of these patients have never had any evidence of endometritis or uterine displacement. One patient has had endocervicitis but this

has existed since her first pregnancy and she has had three children in spite of this condition. Since then she has had 3 abortions and now is found to have a basal metabolism of -21 . Both she and her husband have had several teeth removed because of focal infection.

One patient has often had a retroverted uterus, in spite of which she has had three children as well as these two abortions. The remaining patient had at times a retroverted uterus. Following her first abortion, she was operated upon; her retroverted uterus was suspended and a cystic ovary resected. She became pregnant shortly after this operation, went successfully through her pregnancy and has a healthy child a year and a half old. Following this her uterus was found held in perfect position, but she became pregnant a year later and again miscarried. She was then found to have a basal metabolism of -17 and definite symptoms of hypothyroidism. She has been on thyroid extract for several weeks now and feels very much better.

This last patient and three other patients in this series have had once or twice delayed periods and definite symptoms of early pregnancy. The uterus in each case seemed distinctly enlarged. Then the patient has had a slight flow for a few days and examination after the flowing had ceased showed a perfectly normal uterus. This has happened occasionally with patients in the other groups and certainly leads me to the suspicion that these may have been cases where the products of conception were entirely resorbed. These cases have been under such close observation that it does not seem possible that an embryo even of minute size could have escaped unnoticed.

So much for an analysis of 104 consecutive abortions.

As a basis for a statistical paper this is a small number, but nevertheless it is sufficiently large to yield certain conclusions, which I will now briefly summarize.

In the first place I think it is fair to say that as a result of this study we cannot but feel that endometritis and retroversion play a very minor rôle in the etiology of abortions.

Second, defective germ plasm is the chief cause of abortion.

Third, trauma when sufficiently violent to rupture the amniotic sac is an undoubted cause of abortion.

Fourth, multiple fibroids may cause the death of the fetus in utero with subsequent abortion.

Finally, I believe that defective germ plasm may exist normally and account for an occasional abortion in perfectly healthy individuals with unimpaired fertility; but that it is much more likely to occur where the patient is over- or undernourished or poisoned from within or without. And here besides focal infection we should consider the effect of faulty endocrine function, especially deficient thyroid secretion, defective development of the corpus luteum, and anterior lobe

hormones. It is also possible that focal infection, faulty endocrines, fatigue or other poisons may play a rôle in the creation of spermatozoa capable of impregnating the ovum but lacking the vitality to bring the egg to full development.

Fellow obstetricians, I beg of you to take this subject seriously to heart. We read stirring pleas for the necessity of postmortem examinations in the field of general medicine but scarcely a word from the obstetricians for the study of products of conception following abortion. To obtain permission for an autopsy requires time and eloquence. Products of conception in these early abortions are the unquestioned property of the operator. I believe that the obstetrician who, after an abortion, throws away or fails to have examined by an expert the products of conception and then informs the disappointed patient that she has done too much automobiling, is guilty of negligence, and is through ignorance or laziness giving an explanation as cruel as it is false.

If we are ever to know anything about pathologic embryology it can be only by the combined efforts of clinicians working with laboratory experts. The necessity of studying the products of conception must be taught in our medical schools and the truth about abortion given to the general public.

Then and then only can we build up an accurate method for treatment of threatened abortion, so that should the pregnancy fail, proper steps can be taken to ensure success in the future.

I wish to express my indebtedness to my colleagues, Drs. W. T. Sherman Thorndike and Benjamin Tenney for their cooperation and help in the preparation of this paper.

REFERENCES

- (1) *Pierson, R. M.*: AM. J. OBST. & GYNEC. 14: 333, Sept., 1927. (2) *Riddle, Oscar*: Am. Naturalist. 61: March and April, 1927. (3) *Vignes, H.*: Le Concours Medical. Nos. 27, 29, 31, 35 et 38, July, August, and September, 1926. (4) *Streeter, G. L.*: Personal Communications. (5) *Rock, J.*: Boston M. & S. J. 195: No. 18, Oct. 28, 1926. (6) *Macomber, D.*: Boston M. & S. J. 193: No. 3, 116-119, July 16, 1925. (7) *Williams, J. W.*: Obstetrics, p. 702, New York, 1926. (8) *Huntington, J. L.*: New York State J. Med., Dec., 1922.

24 MARLBOROUGH STREET.

(For discussion, see page 121.)

THE DECIDUAL REACTION IN EXTRAUTERINE PREGNANCY*

By B. S. KLINE, M.D., CLEVELAND, OHIO

(From the Laboratory Department, Mount Sinai Hospital)

IN A STUDY of 74 cases of extrauterine pregnancy, evidence was found for the belief (1) that a decidual reaction of greater or less extent occurs constantly at the site of implantation; (2) that the decidual tissue persists as long as the chorionic villi are intact; (3) that following the termination of the pregnancy by hemorrhage with resultant degeneration of the chorionic villi, the local decidual tissue undergoes involution, and (4) that a distant decidual reaction in other portions of the tube, uterus, or elsewhere is not constant and that when it does occur, it may persist after the degeneration of the chorionic villi and the complete involution of the local decidual tissue.

Concerning the relatively frequent occurrence of vaginal bleeding in extrauterine pregnancy, the impression is gained from a study of 17 curettings in the series that it probably depends upon changes other than the casting off of uterine decidual tissue. In fact the bleeding was much greater in the cases in which no decidual tissue was present in the curettings.

That there is still considerable uncertainty concerning the decidual reaction in extrauterine pregnancy is indicated by the following statement of Williams:¹

“Bland Sutton in 1891, and Fñth and Griffiths a few years later, pointed out that the decidual reaction in the tube was nothing like so extensive as was generally believed; while “Kñhne, Aschoff, and Kreisch were skeptical of its existence, and contended that the cells, which had formerly been described as decidual, were really of fetal origin. The first mentioned view has been confirmed, by subsequent observers, and at present no one claims that a continuous decidual membrane is formed.

“On the other hand, it is erroneous to contend that a decidual reaction is always lacking, as it is possible by careful study to distinguish decidual cells, and to differentiate clearly between them and fetal cells. The former are usually found in discrete patches in the tips of some of the folds of the mucosa in the neighborhood of the ovum. Furthermore, one can occasionally find decidual cells scattered between the fetal tissues at the placental side, but I have never observed a decidual membrane analogous to the decidua vera or serotina in uterine pregnancy.

“That the authors who deny the existence of decidual cells in the tube take too extreme a view is shown by the fact that they have been repeatedly observed by Webster, Both, Couvelaie, Kermauner, Young, myself and others. Moreover, the possibility of a decidual reaction is demonstrated by the fact that I have repeatedly observed characteristic decidual cells in the nonpregnant tube. Observations of this character are beyond criticism, as in such cases it is impossible to confuse

*Received for publication, May 31, 1928.

decidual with fetal cells. Furthermore, Mandl, Lange, and I have noted an identical reaction in the tubes in certain cases of uterine pregnancy.

“The absence, or comparative scantiness, of the decidual reaction is of interest not only from a scientific point of view, but also has a distinctly practical bearing, as it would seem to offer a satisfactory explanation for the invasion and destruction

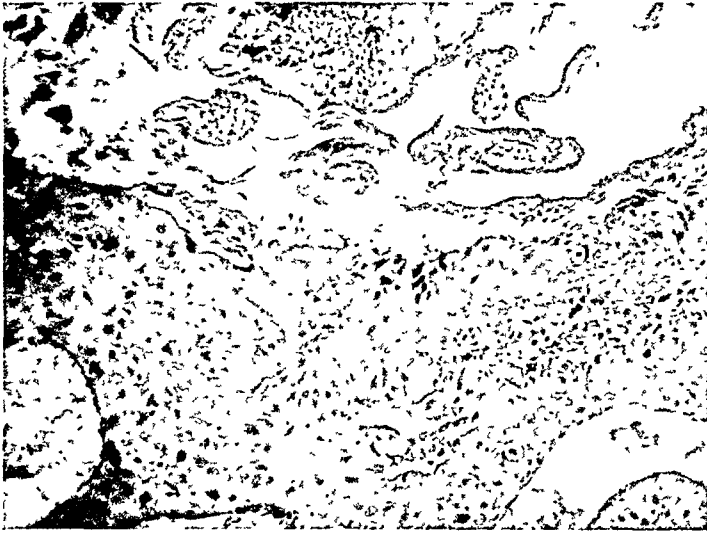


Fig. 1.—(Mag. 100x.) Tubal Pregnancy. Chorionic villi intact, decidual tissue intact.



Fig. 2.—(Mag. 100x.) Tubal Pregnancy. Chorionic villi degenerated, no intact decidual tissue.

of the tube wall by the fetal elements. In uterine pregnancy, such an invasion is noted only in the rare instances in which there is an imperfect development of the decidua, and it would therefore appear that one of the main purposes of its formation is to protect the maternal tissues against the invasion and corrosive action of the fetal cells.”

Polak and Wolfe² from their observations conclude:

"a. Majority of tubal pregnancies are incomplete tubal abortions which are not completely terminated at the time bleeding occurs; and that vaginal bleeding persists as long as the ovum is alive and partially attached to its tubal bed.

"b. That many cases are operated before the ovum dies. In these, decidual reaction is found in tube and uterus.

"c. In those operated after death of the ovum, no decidual reaction is found."

Our study of the decidual reaction in 74 cases of extrauterine pregnancy is summarized in the following tables:

TABLE I.—CASES FROM MOUNT SINAI HOSPITAL

DATE OF OPERATION	SERIAL NUMBER BY DR. RUBIN	LABORATORY NUMBER	AGE	PORTION OF TUBE IN- VOLVED			ALL OR MAJORITY OF CHORIONIC VILLI INTACT	ABOUT HALF OF VILLI INTACT	ALL OR MAJORITY OF VILLI SHOW- ING DEGENERA- TIVE CHANGES	DECIDUAL REACTION				
				PROXIMAL	MID	DISTAL				TUBE		UTERUS	OVARY	
										LOCAL	DISTANT	DISTANT	LOCAL	DISTANT
7/16/23	45	8412	29							0		N.S.		0
9/ 2/23	46	8662	30	+				+		+	0	N.S.		N.S.
9/19/23	47	8716	40			+		+		+		+		N.S.
12/ 2/23	48	8906	26			+	+	+		+		N.S.		N.S.
12/ 5/23	49	8916	38			+		+	+	0	0	0		0
3/27/24	54	9252	32			+		+		+	0	N.S.		N.S.
4/ 7/24	55	9285	28			+	+	+		+	+	N.S.	+	N.S.
7/ 2/24	57	9507	28		+		+	+		+	0	0		0
7/10/24	58	9531	31	+			+	+		+	0	N.S.		0
8/11/24	59	9615	30		+				+	0		N.S.		0
11/ 4/24	62	9847	37	+	+			+		0		0		N.S.
12/10/24	63	9934	31			+		+		0		atypical		0
12/26/24	64	9966	24		+			+		0	0	N.S.		N.S.
3/21/25	65	10228	31	+				+		0		N.S.		N.S.
4/ 1/25	66	10263	26		+	+		+		0		N.S.		N.S.
4/ 2/25	67	10263	35		+	+	+			+	0	N.S.		N.S.
6/ 1/25	68	10402	20		+		+			+	0	N.S.		N.S.
6/ 3/25	69	10416	28	+				+	+	0		N.S.		N.S.
7/24/25	70	10569	27		+			+		+	0	N.S.		N.S.
8/19/25	71	10642	37	+				+		+	0	N.S.	+	
8/26/25	72	10661	35	+					+	0		0		N.S.
9/30/25	73	10778	40		+				+	0	0	0		N.S.
1/ 9/26	74	11086	26	+			+			+	0	N.S.		N.S.
3/11/26	75	11268	24		+			+		+		N.S.		N.S.
6/16/26	76	11525	21		+	+	+			+	0	0		N.S.
9/ 2/26	77	11753	39		+			+		+	0	0		N.S.
9/17/26	79	11809	40	+					+	0		+		N.S.
9/22/26	78	11827		+					+	0	+	0		0
1/21/27		12188	30			+			+	0	0	N.S.		0
2/ 7/27		12255	29			+			+	0	0	N.S.		0
2/19/27		12310	30		+			+		+	0	N.S.		N.S.
2/22/27		12317	30		+		+			+		N.S.		N.S.
3/ 4/27		12363	27	+			+			+		+		N.S.
3/ 7/27		12373	30			+			+	0	0	N.S.		0
3/24/27		12448	29			+			+	0	0	0		0
8/26/27		12958	31			+			+	0	0	0	N.S.	N.S.
10/ 7/27		13115	35	+	+			+		0	0	N.S.		0
11/ 7/27		13223	45	+					+	+	0	N.S.		N.S.
12/ 4/27		13314	23	+					+	+	0	N.S.		N.S.
12/16/27		13347	29	+				+		+	0	N.S.		0
2/ 7/28		13524	32	+					+	+	0	atypical		0
2/17/28		13557	22		+				+	0	0	N.S.		0

TABLE I—CONT'D
WOMAN'S HOSPITAL OF CLEVELAND

DATE OF OPERATION	SERIAL NUMBER BY DR. BUBIS	LABORATORY NUMBER	AGE	PORTION OF TUBE IN- VOLVED			ALL OR MAJORITY OF CHORIONIC VILLI INTACT	ABOUT HALF OF VILLI INTACT	ALL OR MAJORITY OF VILLI SHOW- ING DEGENERA- TIVE CHANGES.	DECIDUAL REACTION				
				PROXIMAL	MID	DISTAL				TUBE		UTERUS DISTANT	OVARY	
										LOCAL	DISTANT		LOCAL	DISTANT
1/21/25		8307	22						+			N.S.	0	
3/31/25		8429	41	+	+	+			+	0		N.S.		N.S.
4/ 5/25		8435	28			+	+			+		N.S.		N.S.
5/19/25		8497	26	+	+			+		0		N.S.		0
5/21/25		8499	30		+				+	0	0	N.S.		N.S.
6/ 9/25		8564	30	+					+	+	0	N.S.		0
11/12/25		8736	35	+				+		+	0	N.S.		N.S.
12/24/25		8792	38			+	+			+		N.S.		0
3/ 3/26		8933	30		+				+	0		N.S.		0
4/17/26		8954	43			+			+	0		N.S.		0
11/ 5/26		9255	33	+	+				+	0	0	N.S.		0
1/26/27		9367	23			+			+	0	0	N.S.		0
1/25/27		9368	39		+				+	+	0	N.S.		N.S.
2/28/27		9429	24		+	+			+	0	0	N.S.		0
3/29/27		9513	27		+	+			+	0	0	N.S.		0
7/16/27		9626	19			+			+	0	0	N.S.		0
7/22/27		9633	23			+			+	0	0	N.S.		0
8/ 2/27		9643	2	+	+	+	.		+	0	0	N.S.	0	0
9/31/27		9748	40	+			+			+	0	+		0
2/16/28		9885	27			+			+	0	+	N.S.		0

HOSPITAL CLINIC OF CLEVELAND

11/21/24		1057	32			+	+			+	0	N.S.	+	
1/14/25		1089	28	+						+	0	N.S.		N.S.
2/19/25		1110	31	+					+	+	0	N.S.		N.S.
5/29/25		1190	33	+	+	+		+		+	0	N.S.		N.S.
6/16/25		1203	27		+	+			+	0		N.S.		0
5/12/26		1453	22			+			+	+	0	N.S.		
5/30/26		1465	27		+		+			+	0	N.S.		N.S.
8/23/26		1572	33			+			+	+	0	N.S.		N.S.
9/22/26		1622	39	+					+	+	0	N.S.		0
2/15/27		1743	25	+	+	+			+	0		+		N.S.
5/ 9/27		1805	31	+	+				+	0	0	N.S.		N.S.
2/28/28		2104	35		+	+			+	0	0	N.S.		0
Total		74 Cases		29	31	32	15	11	44	36	3	5	3	0

NS.=No Specimen.

DISCUSSION OF FINDINGS

From the study charted above, the following conclusions have been reached:

About one-half of the patients with tubal pregnancy in this series were operated upon at a time when the majority or all of the chorionic villi and local decidual tissue were still intact. In the other half, the operations were performed at a time when the majority or all of the villi were partially or almost completely degenerated and the local decidual tissue completely or almost completely involuted. In other words, the evidence suggests that a decidual reaction of greater or less extent constantly occurs locally in tubal pregnancy and that following

the termination of the process by hemorrhage with resultant degeneration of the villi, the decidual tissue undergoes involution. (See Figs. 1 and 2.)

The decidual reaction in the uterus in cases of extrauterine pregnancy has been found to be inconstant and behaves as does the distant decidual reaction in other portions of the affected tube and in other sites. For instance, as will be seen from Table III no decidual reaction was observed in the uterus in 5 cases in which this reaction was present in the tube in the neighborhood of intact chorionic villi, and on the other hand was present in 2 cases in which no decidual tissue was present at the implantation site where the chorionic villi showed degenerative changes. (See Figs. 3 and 4.) In this series then, the uterine curettings in one-half of the cases yielded no information or false information concerning a viable tubal pregnancy. The distant decidual reaction in the tube was likewise found inconstantly and ap-

TABLE II.—DECIDUAL RELATION IN EXTRAUTERINE PREGNANCY

	FALLOPIAN TUBE					UTERUS				OVARY				
	INTACT DECIDUAL TISSUE LOCALLY	ALMOST INVOLUTED OR NO DECIDUAL TISSUE LOCALLY	INTACT DISTANT DECIDUAL TISSUE	NO DISTANT DECIDUAL TISSUE	NO RECORD DISTANT POR- TIONS OF TUBE	INTACT DISTANT DECIDUAL TISSUE	INTACT DISTANT ATYPICAL DECIDUAL TISSUE	NO DISTANT DECIDUAL TISSUE	NO SPECIMEN	INTACT DECIDUAL TISSUE LOCALLY	NO DECIDUAL TISSUE LOCALLY	INTACT DISTANT DECIDUAL TISSUE	NO DISTANT DECIDUAL TISSUE	NO SPECIMEN
TOTAL	36	37	3	51	20	5	2	10	57	3	1	0	32	38
All or majority of chronic villi intact	15		1			2		2		2				
About half of villi intact	9	2						1		1				
All or majority of villi show- ing degenera- tive changes	10	34	2			2	2	8			1			
No record of condition of villi	3	2				1		1						

TABLE III.—RELATIONSHIP OF UTERINE AND TUBAL DECIDUAL REACTIONS IN TUBAL PREGNANCY

	UTERINE CURETTINGS		
	INTACT DECIDUAL TISSUE PRESENT	ATYPICAL DECIDUAL TISSUE PRESENT	NO DECIDUAL TISSUE PRESENT
TOTAL	5	2	10
Intact decidual tissue locally in tube	3	1	4
Almost involuted or no decidual tissue locally in tube	2	1	6

parently occurs and involutes much as that in the uterus in tubal pregnancy.

The study of the cases described above supports the view that the usual termination of tubal pregnancy by hemorrhage depends upon the inability of the relatively scant decidua to prevent invasion of the large vessels of the tubal wall by the trophoblast.



Fig. 3.—(Mag. 100x.) Tubal Pregnancy. No intact decidual tissue at implantation site. (Chorionic villi degenerated.)



Fig. 4.—(Mag. 100x.) Uterine curetting in degenerating tubal pregnancy. (See Fig. 3.) Decidual tissue intact.

Concerning the relatively frequent occurrence of vaginal bleeding in extrauterine pregnancy (in 39 per cent of the cases observed by Dr. Bubis³) the impression is gained from a study of 17 curettings in this series that it probably depends upon changes other than the casting off of uterine decidual tissue. In only 5 of the 17 cases was decidual tissue found in the curettings. In 2 cases the stromal cells were

swollen but were not typically decidual in type. In 7 the appearance was that of interval endometrium, and in 3 the picture resembled that of premenstrual endometrium; a few showed some inflammation and one an early polypoid change. In the majority of these cases there was vaginal bleeding which at times was profuse. The bleeding was least marked in the cases with decidual tissue in the curettings and most profuse in those with none in the curettings but with intact decidual tissue and intact chorionic villi in the tube.

CONCLUSIONS

In a study of 74 cases of extrauterine pregnancy, evidence was found for the belief:

1. That a decidual reaction of greater or less extent occurs constantly at the site of implantation.
2. That the decidual tissue persists as long as the chorionic villi are intact.
3. That following the termination of the pregnancy by hemorrhage with resultant degeneration of the chorionic villi, the local decidual tissue undergoes involution.
4. That a distant decidual reaction in other portions of the tube, uterus, or elsewhere is not constant, and that when it does occur, it may persist after the degeneration of the chorionic villi and the complete involution of the local decidual tissue.
5. That the relatively frequent occurrence of vaginal bleeding in extrauterine pregnancy probably depends upon changes other than the casting off of uterine decidual tissue.

REFERENCES

- (1) *Williams, J. W.*: Textbook of Obstetrics, New York, 1926, D. Appleton & Co., ed. 5, p. 728. (2) *Polak, J. O., and Wolfe, S. A.*: AM. J. OBST. & GYNEC. 8: 730, 1924. (3) *Bubis, J. L.*: (See article in this issue.)

Moulouguet, M. P.: Intravaginal Prolapse of the Fallopian Tube After Colpotomy. Bulletin de la Société d'Obstétrique et de Gynécologie, 1928, No. 2, p. 131.

After a colpotomy a mass of tissue was found in the vaginal vault which resembled a papilloma; however, after removal it was found to be a fallopian tube. The author points out that intravaginal prolapse may be found after two operations; namely, colpotomy and vaginal hysterectomy with conservation of the adnexa. The accident apparently is rare, because the author could find no reference to it in either the French or the German literature. Kelly, however, describes it explicitly in his *Operative Gynecology*.

J. P. GREENHILL.

IMPETIGO OR PYODERMATITIS NEONATORUM*

BY CHARLES B. REED, M.D., CHICAGO, ILL.

(*Chief Obstetrician, Wesley Memorial Hospital*)

HISTORY.—Tilbury Fox described the contagious impetigo of children and infants in 1864. He called attention especially to the vesicular form which now appears in our maternities. Almquist, in 1891, showed that the infecting organism was a staphylococcus. Matzenauer, in 1900, linked pemphigus neonatorum to impetigo contagiosa by proving the identity of the activating microbe. Animal inoculation generally failed but in 1911, Landsteiner and his associates produced pemphigoid lesions in the chimpanzee.

With these several discoveries the knowledge of impetigo remained about stationary until 1917. Curiously enough no widespread epidemic called any particular attention to the disease in the fifty-three years that elapsed after its recognition by Fox. In 1917, however, as our questionnaire verified, this affection hitherto rare and sporadic, suddenly changed its type and appeared in more or less virulent epidemics. Very few maternities were exempt and some of us who had had no experience with impetigo as a nursery problem, were overwhelmed by the flood of cases. Everywhere our nurseries were treated like contagious disease hospitals but only with partial success. Many were closed entirely and others should have been.

Dr. F. H. Falls, finding himself in the presence of a serious outbreak, identified the disease by the organism and filled with laudable zeal proved his diagnosis by autoinoculation which in twelve hours resulted in a vesicle from which he cultured again in forty-eight hours the staphylococcus.

Such a history inspires questions and speculation. Why should a disease which has been quiescent for over half a century, as the literature indicates, take on at a particular time the epidemic form and appear simultaneously all over the country? Again, why should a hospital like Wesley Memorial, in which the infection has never been seen, abruptly encounter five visitations in a period of ten years, epidemics which spread over a term of one or two months each? We can only speculate.

The immunity of the mother and the baby was undoubtedly diminished but why and how? Was it due to the emotionalism of the war? Was it an increase of carbon monoxide in the air? Was it some change in food like a lack of carbohydrates or did the ever present staphylococcus change in type or virulence?

*Read at a Meeting of the Chicago Gynecological Society, March 16, 1928.

The purpose of this paper is to call attention to these unanswered questions and to report a hitherto questionable factor in the etiology.

Bacteriology.—It has been shown by Matzenauer and confirmed by all subsequent observers that the activating organism in impetigo is usually a peculiar strain of *Staphylococcus aureus* or *albus*, though other bacteria like the streptococcus are encountered occasionally. Our own experience coincides with this conclusion which has been ably discussed and summarized by Belding.

That the organism is not always the same in character and potency is urged by Baerthlein, who isolated four distinct types of staphylococci from one bleb. His work seemed to show that the diversity of type was due to variability within species. It is also Mellon's opinion that the staphylococcus and streptococcus are saprophytic most of the time but have "cadences of virulence" in which impetigo is one pathologic manifestation.

Microscopically as well as macroscopically the blebs show many diversities. Some are sterile and some are not. In the congenital cases reported by Labhardt and Waltart in 1908, some of the vesicles contained no microbic elements but did show white cells, and some polynuclears. Our own findings in congenital cases were similar except in two instances.

Nomenclature.—The bullous exanthema which occur in the course of many septic conditions may be symptomatic of the same underlying cause in pemphigus or merely a kindred phenomenon but it is more rational to consider the mild pemphigus of the newborn as closely allied to what is termed impetigo contagiosa. Many observers accept this and McCandlish further suggests that dermatitis exfoliativa, through its staphylococcus origin, belongs in the same category, though probably a more malignant form. Multiple abscess, which is frequently associated with the just mentioned diseases, has also the staphylococcus as its causative agent. Since the histologic findings are essentially identical in all these diseases which show a common origin, it is justifiable to assume that pemphigus, impetigo, multiple abscess, and dermatitis exfoliativa when occurring in the newborn are parts and phases of the same affection though in this we go somewhat farther than Matzenaur and McCandlish have indicated. All are due to the staphylococcus or streptococcus or both, and all may appear at the same time on the same individual; the variations in the clinical picture being due to different strains or different combinations of the invading organisms together with differences in soil, in resistance and in the idiosyncrasy of the patient.

In one case of congenital impetigo hereinafter reported the baby was born with impetiginous pustules on the scrotum, developed blebs of pemphigus on the hairy scalp and a circumscribed collection of

fluid under the scalp. Thus three aspects of the disease with only one evident etiology were present in the same individual at the same time.

If we admit the force of the data presented it would seem best to separate these diseases which belong distinctively to the newborn from those similar affections in older children which do not always have the same clinical appearance or etiology (Belding). The infections of older children are well established in the professional mind as pemphigus, impetigo, and multiple abscess, and we propose that this kindred group of skin infections in the newborn which has been confused by inappropriate, indistinctive, and misleading names be henceforth combined under one specific designation.

We therefore suggest the name of pyodermatitis neonatorum because it is descriptive of the histologic findings. To be sure, this term combines a Greek noun with a Latin qualifier but both are the tongues of science. Adjectives like contagiosa, benigna, and maligna can be added if necessary for completeness. Thus we have the following:

Definition.—*Pyodermatitis contagiosa neonatorum*, an acute contagious inflammatory disease of the newborn infant, characterized by discrete, flat, umbilical, superficial blebs or vesicles on a mildly hyperemic base, which contain a clear, an opalescent fluid or pus and tend rapidly to subside or to rupture with consequent exfoliation of the skin, or to develop further into subdermal abscesses.

Morbidity.—The seriousness of the disease manifestly depends on the severity of the attack and the susceptibility of the baby. It is probable that in general 30 per cent of all babies exposed will show signs of the infection. Belding gives 20 to 30 per cent and Dickey 34 per cent. The mild cases are self limited, with a cycle of about twelve days. The health of the baby is not materially affected. There are no constitutional symptoms. The virulence of the germ is slight. The baby is well nourished and usually fever free. On the other hand, if the child dies, a higher potency of the invading organism must be suspected. That death is not rare in the graver forms is shown by several observers. Thus in Biddle's epidemic 30 per cent died. Cole and Rue lost 1 out of 9 cases; Schwartz 25 per cent and Hartzell 50 per cent. Falls had 2 deaths in 47 cases and McCandlish 1.3 per cent. Belding's average taken from 15 observers is 21 per cent.

Transmission.—Since the staphylococcus usually and the streptococcus sometimes is the etiologic factor, how does the child get the disease? The babies themselves give no clue, for the well nourished are affected as frequently as the weaklings. Indeed male and female, fat and lean, premature and postmature, and babies spontaneously or instrumentally delivered are all attacked equally. In Waltart's case one of a pair of twins was born with impetigo while the other was clean and remained so.

The five most obvious means of conveying the contagion are: the attending physician or nurse, other infants, the paraphernalia of the nursery and the mother.

The physician is undoubtedly a carrier. The unclean obstetrician, the gynecologist whose hands are daily plunged into suppurative pelvic organs, the general surgeon who handles pus cases, the interns who dress them, and the general practitioner who is compelled to attend illnesses that are openly or only possibly septic, cannot exonerate themselves from guilt if they take on obstetric work or enter the nursery or handle the babies without the most elaborate antiseptic precautions. Young children and other lay visitors to the nursery are even more liable to be carriers, for the staphylococcus is everywhere.

A healthy infant can easily be contaminated through direct or indirect contact with other babies either before or after the signs of the disease have appeared. Again the infected baby may infect its mother or nurse, as Falls reports, and these in turn will spread the epidemic. In Abegg's case of congenital pemphigus the baby died on the second day but an epidemic in the nursery followed.

The nurse is in constant attendance on the babies and may have the organisms on her person as an acne, a suppurating antrum or a chronic nasal infection. At other times she may carry the infection from one baby to another or from septic contacts elsewhere. Relief nurses are especially apt to carry contagion into the maternity.

The utensils in the nursery may be at fault. The clothing, bedding, and linen can be autoclaved and made reasonably safe but certain objects may escape the most painstaking efforts. Thus Dickey, after providing his babies with what he thought was a definitely sterile environment, tested his precautions by culture and got positive growths of staphylococci from the scale tray, from the towel over the tray, from the bath thermometer, the table drawer, and the water, from the shower.

Mothers with erysipelas, acute abscesses, cellulitis, and impetigo obviously may be a source of contamination to the baby. A breast with staphylococci in the gland tissue or in the milk may start a widespread epidemic.

Mellon and his associates made cultures of the maternal milk from the superficial ducts and from the deeper recesses of the breasts and demonstrated the staphylococcus. In tracing epidemics this possibility must not be overlooked. Apparently the so-called normal human milk contains a varying percentage of staphylococci. Mellon states that probably 30 per cent show positive cultures and yet mastitis does not occur nor do the babies necessarily have pemphigus. He also states that the organism can be present in the blood stream with few or no symptoms.

Kostlin claims the staphylococcus is present in the milk of 23 per cent of pregnant women while Cohn and Neumann will admit only 2 per cent or less. In the milk of 137 puerperal women examined by Kostlin, he found the *Staphylococcus albus* in 132 and the *Staphylococcus aureus* in 79. In response to our questionnaire, the Nebraska Methodist Hospital reported that the breast milk from all but one of the mothers of their infected babes gave positive cultures of staphylococcus.

Making all allowances for errors in these data we must agree with Mellon and regard the breast milk as one probable source of infection. Naturally it can be excluded where the baby does not nurse and where the eruption occurs before the baby goes to breast. In two of our own cases, breast abscesses developed and the babies broke out with pustules so nearly at the same time that it was impossible to say which infected the other or whether both were due to some common source like the milk.

It is evident that after the child is delivered, the opportunities for contamination are innumerable but what shall we say about the congenital cases? Must we consider these as cryptogenic infections wherein no port of entry can be discovered?

In the series of congenital pemphigus and impetigo reported by Labhardt and Waltart we get no clue to the origin of the infection. No milk or blood cultures are reported. One mother had phlebitis before confinement and may have had organisms circulating in the blood at the time of labor. It is possible too that many of the pemphigoid blebs are due to toxins from angina, influenza, or other similar infections. Nevertheless, most of the mothers in the Labhardt series were apparently in good health even where the streptococcus was found in the bleb. Even so we cannot exclude a blood contamination with placental transmigration.

Infection from the vagina could occur if the interval between the rupture of the membrane and the delivery was long enough but this was possible only in one instance. Von Reuss states that healing lesions have been found on the newborn infant which can only be interpreted as proof that infection occurred before the rupture of the bag of waters. If the blebs are explained as a product of an obscure toxin in the mother or baby then the pustule must be due to some endogenous agent. If the mother furnishes the germ there are still two barriers to be passed, the placenta and membrane whether injured or uninjured. Spirochetes, tubercle bacilli and the germs of variola and scarlatina can pass the uninjured placental wall. That other bacteria can also be carried through by the blood stream we must assume and the more readily if the filter is defective. Hellendall claims that bacteria from the peritoneal cavity can penetrate the uninjured membrane by way of the tubes but again we are moved to

ask how the organisms can reach the baby if the liquor amnii is sterile as Raineri demonstrated in 1907? Does a sterile liquor amnii sterilize also a pustule or bleb arising from a blood borne infection?

Congenital Infections.—Admitting contamination by contact from nurse, mother, doctor, nursery paraphernalia, and the milk as well as from other babies, we still have cryptogenic cases and the congenital infections. Labhardt and Waltart report sixteen instances of congenital pemphigus or impetigo. In response to our questionnaire the Fifth Avenue Hospital of New York, reports two more "discovered before the cord was cut." To these eighteen we desire to add nine cases which have appeared in the Wesley Hospital Maternity since 1925. It is probable that many were overlooked prior to this date.



Fig. 1.—Congenital impetigo from *Streptococcus hemolyticus*

The babies in this series all showed distinct blebs or pustules. The two that came first slipped by us with notation only for we were not familiar with Labhardt's work and regarded the event dubiously. The next seven came along at irregular intervals. The blebs and pustules on five were sterile. We found only leucocytes, some being polynuclear, as signs of inflammatory changes and microbic activity. Whatever germs had been present had perished and undergone absorption. From the pustules of one, however, we obtained a positive culture of staphylococcus. Thus out of these eight cases only one was unimpeachably diagnostic.

This was the situation when on February 9, 1928, Baby H. was born in the service of Dr. Hauch by whose courtesy this report is allowed. The child was

a male, about three weeks overdue and weighed ten pounds and fourteen ounces. He was delivered at 5:08 A.M. and examined immediately. A slight hypospadias was present on an otherwise fine body. On the swollen scrotum were fifteen umbilicated pustules varying in size from 2 mm. to 5 mm. These pustules were deep yellow in color and apparently undergoing retrograde metamorphosis. The field of infection was photographed by Dr. Mason. The Kahn test and Wassermann were done on mother and baby, and smears and cultures made from the pustules by Dr. Thurman. Twelve hours after birth the hairy scalp was covered with small pemphigoid blebs. Twenty-four hours after birth, a large subdermal fluctuant mass appeared over the left parietal bone. Thirty-six hours after birth several punctate yellow-headed pustules developed on chest and abdomen.

The Kahn test and Wassermann were negative for mother and baby. The cultures made from the blebs, from the fluctuant subdermal mass on the scalp, and the secondary pustules on the chest and abdomen were negative. The culture of the primary pustules on the scrotum gave a positive growth of *Streptococcus hemolyticus*. The child was fever free, nursed well, and gained weight. On the eighth day an indurated nodule as large as a bean appeared on the left cheek. This also, after eight days, subsided without suppuration which suggests that the immunity had become generally established. The mother gives a history of tonsillitis four weeks prior to delivery.

The milk appeared in the mother's breasts at the usual time and upon withdrawals of specimens by Mellon's technic it was found that all the fluid, deep and superficial, gave almost pure cultures of *Micrococcus tetragenes*.

Belding states that no etiologic relationship has been established hitherto between the streptococcus and so-called impetigo contagiosa. This, therefore, must be the first report of an obviously uncontaminated case due to the *Streptococcus hemolyticus*. The streptococcus, according to report, is extremely rare as the sole activating organism. To speak further than this would be mere speculation.

This case has awakened a new interest in the neglected and almost forgotten pioneer work of Labhardt and Waltart and by emphasizing the possibility of intrauterine infection gives us a new factor in the etiology which must be reckoned with hereafter when epidemics arise.

Prevention.—Prophylaxis in the maternity took on an extreme aspect when the first epidemic of impetigo visited Wesley Hospital in 1917. The walls, tables, cribs, and woodwork were scrubbed with soapsuds, wiped off with cresol solution and repainted. The linen, bedding and all movable utensils were autoclaved. Bottles, nipples, and every shred of material that touched the baby were twice sterilized. The tub baths were given up and a slab and spray system installed. Albolene, borated lard, and other unguents which were regarded as essential for the removal of vernix caseosa were abandoned and sterile green soap from sterile containers was employed. Babies were not handled except for washing, changing, and taking to breast and then by nurses who passed their hands through chlorine or bichloride solutions between each case. Frequent inspection of well infants was observed to provide for prompt quarantine. In every instance where blebs or pustules appeared they were opened with aseptic

care, treated, and the baby isolated under the care of a special nurse, who handled the case with gloves. Whether these precautions made any difference in the spread of the disease we cannot say, for epidemics came and went.

Treatment.—The active management of our first infections followed the methods ordinarily successful in older children. We began with ointments like ammoniated mercury and found them useless. Where the blebs were punctured and covered with the ointment, new vesicles formed underneath. Mercurochrome and iodine were no better. Dusting powders containing boric acid or formalin helped some but dermatol was too harsh on the skin when continually applied. Meanwhile the blebs were opened by a sterile needle or by a pledget of gauze soaked in 95 per cent alcohol and the pustules and abscesses were iodinated and opened with antiseptic precautions. At the present time all the spots of irritation, either advancing or receding, and all the opened blebs and pustules are washed with alcohol or a 1-200 solution of hypochlorite of sodium and covered with calamine lotion. A 5 per cent or 10 per cent solution of silver nitrate is sometimes applied to the opened pustule and the quartz light is used where the pustules are numerous.

After our attention had been called to the diminished immunity hypothesis by the occurrence of the congenital infections we thought of vaccines and this brought us to the question of immunogen. Immunogen is made from the ectoplasm of the bacterial cell and theoretically has all the virtues of the vaccine without the toxin. It is an aqueous solution of the antigens of *Staphylococcus albus* and *aureus* with a trace of phenol for preservation.

Our purpose was to inject fifty consecutive cases in the general service and have the private cases as a control. This study was carried out with conscientious thoroughness by our resident obstetrician, Dr. Thurman. In all we injected forty-eight babies but two were withdrawn from the series after two injections because one was found to have an enlarged thymus and the other developed projectile vomiting. Out of the forty-six injected babies, seven showed pustular eruptions on the third, fifth, and eighth days but they all cleared inside of two days. Thirty-nine, or 80 per cent, were untouched by disease.

During this period twenty-seven private cases passed through the maternity without immunization. Twenty-four of these, or 88 per cent, had pustules. The epidemic now ceased and the experiment was discontinued.

Conclusions. of course, are impossible from such scanty data but according to our present hypothesis it would seem that a certain proportion of the babies become infected in utero and the pyodermati-

tis passes through its various stages to recovery as the healed lesions reported by von Reuss would indicate.

In the next degree it is found on careful examination that vesicles or pustules exist at birth. The outbreak, however, is stationary or retrogressive. Some of the older eruptions will contain germs, but since immunity was practically established at the date of delivery the new blebs that develop do not become infected. The subdermal accumulations of fluid as well as the indurated nodules are aborted in their evolution. Suppuration does not occur in any of these foci and the skin rapidly clears. This theory is supported by the fact that so many of the earlier lesions in our series and in Labhardt's were sterile together with the clinical picture presented in the case of congenital pyodermatitis on which this paper is based.

At other times, the infections in utero of later onset may continue in a state of active inflammation up to the birth. Now the pemphigoid vesicles break out on or before the third day of life as a result of the circulating toxin. The contents become infected, pustules form and the disease may pass on into the multiple abscess stage with positive germ cultures at all times demonstrable. Meanwhile the baby is constantly a potential source of contamination to other individuals as Abegg's case exemplifies.

Where the blebs and pustules are not of congenital origin the eruption must break out as late or later than the second day as Fall's autoinoculation proves. These babies which break out on the third day or later are infected by the milk, by contaminated apparatus, by other babies or carriers. In every case of this kind the milk should be suspected and cultured by Mellon's technic.

The rather surprising results of the immunogen experiment would indicate that diminished immunity is a very pronounced factor in the contagion and while none of the prophylactic measures hitherto described can be neglected, yet the evidence strongly indicates that success in prevention can be completely achieved only by raising the resistance of mother and baby to a point where pyogenic organisms cannot live.

REFERENCES

- Almqvist*: Ztschr. f. Hyg. u. Infektionskrankh., 1892, 253. *Biddle*: Jour. Cutan. Dis., 1914, xxxii, 268. *Bacrhlein*: Centralbl. f. Bakteriöl., 1918, Abt. 1, lxxx, 369-435. *Belding*: AM. JOUR. OBST. AND GYNÆC., 1926, xi, 70. *Blaisdell*: Jour. Am. Med. Assn., Sept. 13, 1924, 83, 833. *Breinl, u. Mischer*: Centralbl. f. Bakteriöl., 1923, Bd. 90, 224. *Clegg and Wherry*: Jour. Infect. Dis., 1906, iii, 165. *Cole and Ruh*: Jour. Am. Med. Assn., Oct. 3, 1924, No. 63, 1159. *Dickey*: Arch. Pediat., N. Y., 1926, No. 43, 145. *Falls*: Jour. Infect. Dis., 1917, No. 20, 86. *Farley and Knowles*: Arch. Dermat. u. Syph., June, 1921, iii, 753. *Foerster*: Jour. Am. Med. Assn., July 31, 1909, liii, 358. *Flehme*: Dermat. Ztschr., 1920, xxxi, 111-129. *Hellendall*: Beitr. z. Geburtsh. u. Gynäk., 1906, x, 275-299. *Knowles and Munson*: Arch. Dermat. u. Syph., March, 1923, vii, 376. *Kostlin*: Arch. f. Gynäk., 1897, liii, Hft. 2, 201. *Labhardt u. Waltart*: Ztschr. f. Geburtsh. u. Gynäk., 1908, lxi, 600-613. *Landsteiner, Lavaditi, u. Praser*: Compt. rend. Soc. de

biol., 1911. *Leroux*: Ann. de dermat. et de syph., 1893, iv, No. 3, 290. *Lewandowsky*: Arch. f. Derm. u. Syph., 1922, cxxxviii, 438-445. *Matzenauer*: Wien. klin. Wchnschr., 1900, xiii, 1077. *Mellon, Caldwell, and Winans*: Am. Jour. Med. Sc., 1925, No. 169, 419. *McCandlish*: AM. JOUR. OBST. AND GYNEC., 1925, No. 9, 234. *Raineri*: Gynäk. Rundschau, No. 23 and 24, 1907, 903-950. *Smith and Burke*: Bull. Johns Hopkins Hosp., March, 1924, No. 35, 78.

(For discussion, see page 133.)

REPORT OF A CASE OF PLACENTA ACCRETA; WITH A DISCUSSION OF ITS TREATMENT AND THE UNUSUAL SEQUELAE*

BY ROBERT A. WILSON, M.D., BROOKLYN, N. Y.

(From the Department of Obstetrics of the Methodist Episcopal Hospital)

IN REPORTING and discussing this case of placenta accreta I feel I may aid in further clarifying our conception of this condition, particularly its treatment. The sequelae to be described are rare and, for this reason, worthy of presentation.

Mrs. A. F., age thirty-four, para iii, entered the Methodist Episcopal Hospital, October 10, 1925.

The family and past history were negative, and two previous pregnancies were without complications. Two weeks before admittance the patient gave birth at home to a full-term child; the delivery being spontaneous and without lacerations. With the greatest difficulty and the use of considerable pressure, the placenta was delivered one hour later, and as one cubic centimeter of pituitrin had been administered immediately following delivery, the difficulty was ascribed at the time to the use of this drug. The placenta was hurriedly inspected and, although rough and shaggy, appeared to be intact. On the second, fourth, and tenth days postpartum free bleeding occurred, lasting from one half to two hours. Bleeding was continuous from the tenth to the fourteenth day, the patient becoming pale and weak, and her general condition more and more serious. During this period no internal examinations were made.

Immediate examination in the hospital revealed a woman seriously ill, pale, restless, with widely dilated pupils, and a pulse rate of 130. A subinvolved uterus with some tenderness over the fundus was found. Her temperature was 98.2° F.; blood pressure, 90/50; the urine, negative; and a blood count showed 2,700,000 red cells, the hemoglobin being 40 per cent and the leucocytes 31,000 with 90 per cent polymorphonuclears.

Operation revealed free bleeding from a cervix widely open and readily admitting the examining fingers. A mass, the size of a tangerine, firm and densely adherent, was found attached to the fundus and right lateral wall. It was impossible to find any line of separation. With difficulty, using placental forceps, the mass was removed piecemeal, although considerable uterine tissue came with it, and it was only by using much care that a perforation of the uterus was avoided. Hemorrhage was profuse, which necessitated packing with mercurochrome gauze, and the patient was returned to bed in fair condition.

*Read before the section of Obstetrics and Gynecology of the New York Academy of Medicine, March 22, 1927.

This packing was removed twenty-four hours later, her condition being then so good that a previously planned blood transfusion was not deemed necessary.

The tissue removed at operation and sent to the pathologic laboratory was later reported as placenta and small fragments of uterine musculature.

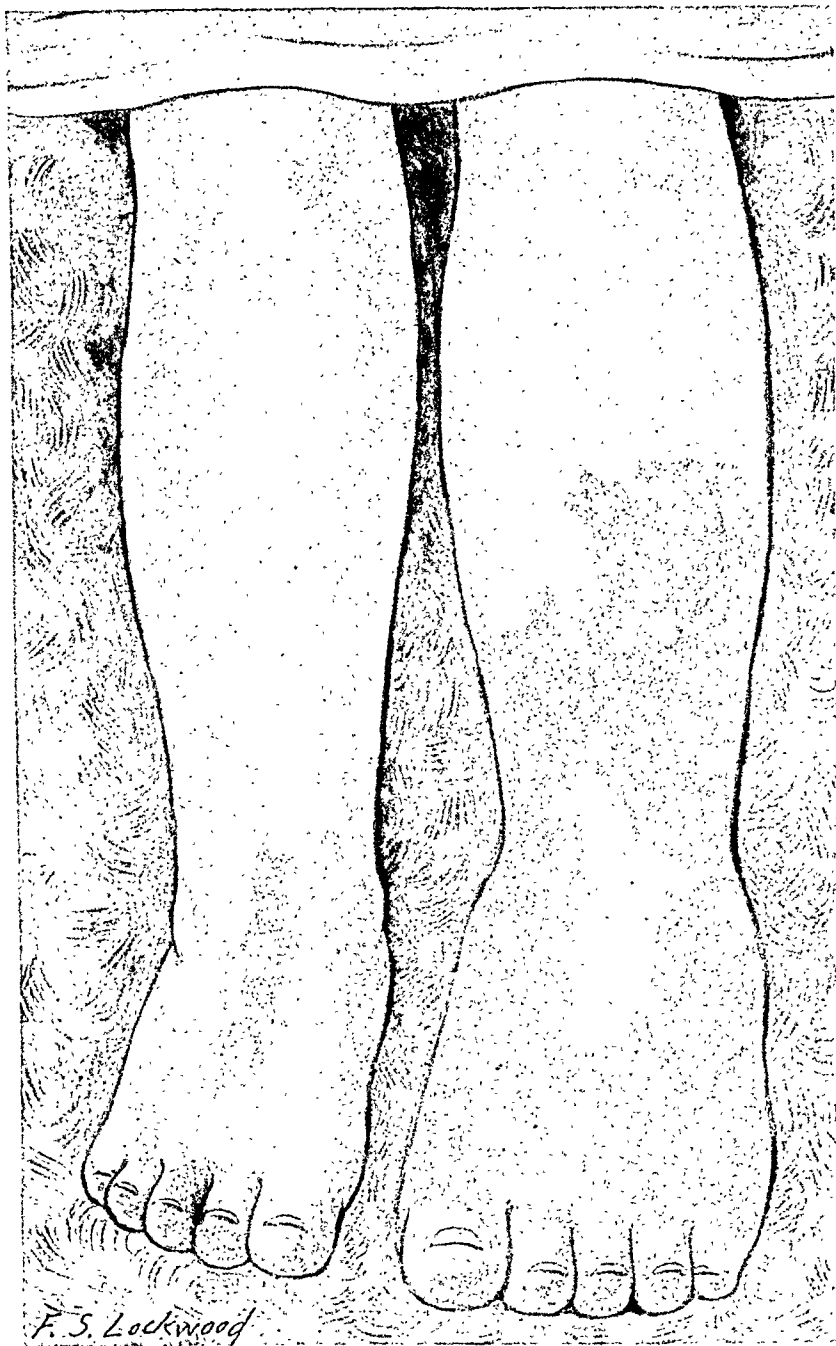


Fig. 1.—Complete gangrene of the left leg, with line of demarcation. Partial gangrene of right foot with death of middle toes.

Third day postoperative: The general condition was good, but a tingling sensation, later followed by radiating pains in the left foot and ankle, had occurred. An examination showed slight swelling and some tenderness of these parts.

Fourth day: Her condition was still good, but the foot, ankle, and lower six inches of the left leg were tender, moderately swollen, slightly discolored, and cold. The pain in these parts was most severe and was not relieved by local measures.

The veins were not tender, but the anterior tibial pulse was faint, although the femoral pulse was good. A blood culture was taken and later reported negative.

Fifth day: A change in the general condition had taken place, the patient appearing pale and sick. Her temperature was 100° F.; pulse, 110, and respira-



Fig. 2.—Section of that part of the uterus from which the placenta was removed, showing the massive gangrene of the tissues. Note the well-formed leucocytic zone and the thrombosis of all the vessels.

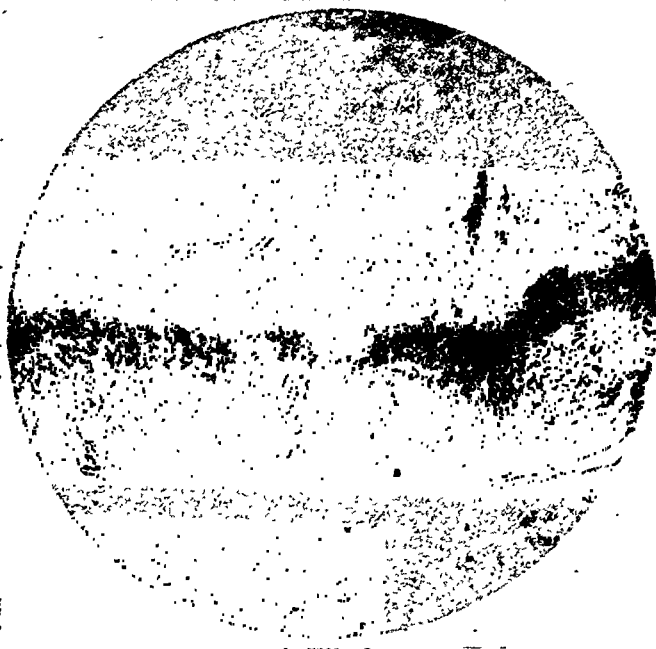


Fig. 3.—Photomicrograph of wall of uterus, showing the well-formed leucocytic zone and the complete thrombosis of the vessels. Below the leucocytic zone the death of the tissues is complete, while above it some cell outlines are discernible, indicating a less advanced process.

tions, 36. Although the swelling of the left leg was less than on the previous day, there was a marked increase in the discoloration of the toes and foot and an extension of this discoloration to within four inches of the knee. No femoral pulse could be detected.

Sixth day: The condition of the left leg was about the same and for the first time the right foot and toes were found to be cold, slightly swollen, tender, discolored and the tibial pulse no longer present. A blood count at this time showed 2,800,000 red cells and 44 per cent hemoglobin; a transfusion of 650 c.c. of blood was given. This was followed by a chill and no general improvement.

Seventh day: The patient was much worse, complaining of severe pain in the right foot and complete loss of sensation in the left. The temperature was 103° F.; pulse, 120; respirations, 25, and blood pressure, 110/60. For the first time marked tenderness was present over the entire uterus, the involution of which was markedly retarded.

Eighth day: Her general condition was still worse, the pulse was thready, and stimulation was now being used. The left leg had become gangrenous with a line of demarcation four inches below the knee, and there were blebs on the foot and

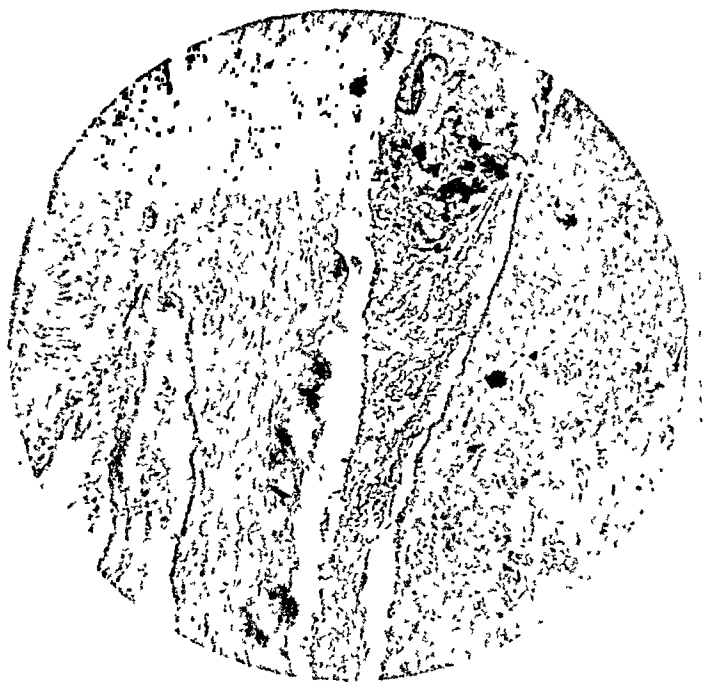


Fig. 4.—Photomicrograph of the uterine wall, showing thrombosis of the vessels, large amount of detritus and dead muscle cells, swollen, pale and difficult to outline.

toes. The femoral pulse in the right leg was now markedly impaired, the foot more discolored, and the second and third toes gangrenous.

Ninth, tenth, and eleventh days: The patient's condition became more and more critical, the temperature remaining about 105° F.; pulse, 140; respirations, 25, and during this time the local findings showed further progression of the gangrene. Blood cultures taken on the sixth and eleventh days were later reported positive, showing a nonhemolytic streptococcus.

Twelfth day: The patient expired. A blood count taken just before death showed red cells 2,300,000; hemoglobin, 38 per cent; leucocytes, 41,000; polymorphonuclears, 90 per cent, while previous blood chemistry and Wassermann examinations had been negative.

Postmortem Examination.—Permission for this was obtained with great difficulty and solely on the condition that the examination be limited to a small incision in the abdomen and one only in the left thigh.

The parietal and visceral peritoneum were normal as were the liver, pancreas, kidneys, and other abdominal organs, with the exception of the spleen, which was moderately enlarged, soft, and friable.

The uterus was 12 cm. in length, very soft and flabby, and the fundus was adherent to a coil of intestine which was easily separated. Beneath this adhesion was a black, gangrenous area 7 cm. in diameter. The entire uterine wall was gangrenous, with the most advanced process at the fundus from which the placental mass had been removed, and the cavity of the uterus was lined with black, shaggy, necrotic tissue, thickest at the fundus. The tubes and ovaries were substantially



Fig. 5.—Cross-section of the left external iliac vessels, showing the collapsed artery and thrombosed vein.



Fig. 6.—Cross-section of left femoral artery and vein, showing a thrombosis of the latter.

normal, but the pelvic peritoneum was dull, covered with a thin coat of fibrin and there were a few cubic centimeters of cloudy fluid in the culdesac.

All the veins in the broad ligaments were thrombosed. The left external iliac and femoral veins were filled with a continuous organized thrombus which was attached to the wall of the vein and could not be removed. Another antemortem thrombus, 20 cm. long, was removed from the right external iliac and femoral veins, this thrombus being apparently of more recent formation than the one on the left side. Both iliac arteries were collapsed and empty.

After cutting down upon the femoral vessels in the left thigh the vein was found to be completely thrombosed as far as it could be traced, but the artery was empty. Sections of these vessels were taken for microscopic examination.

There was slight swelling and marked discoloration of the left leg commencing four inches below the knee, with a definite line of demarcation at this point, the tissue above this line appearing healthy. The ankle, foot, and toes were also gangrenous with a few scattered blebs. The anterior surface of the right foot showed a purplish discoloration, beginning at the ankle and increasing distally, and the two middle toes were black.

Diagnosis.—Placenta accreta, gangrene of uterus, pelvic peritonitis, venous thrombosis, and gangrene of lower extremities.

This was a case of partial placenta accreta, and the question naturally arises as to whether or not the best method of treatment was



Fig. 7.—Photomicrograph of left external iliac vessels, showing the empty artery with normal intima. The vein is occluded by a well-organized thrombus, the blood clot having been completely replaced by young fibrous tissue. The intima of the vein is thickened and merges imperceptibly with the thrombus in which is also noted considerable leucocytic infiltration.

followed. Would a better result have been obtained if, upon finding that manual removal of the placental fragment could not be done without damage to the uterine wall, the uterus had been packed and a subsequent hysterectomy performed? I believe that an affirmative answer to this question, while naturally impossible of proof, is reasonable. Numerous writers have shown the dangers of manual removal in this condition. We should not confuse the ordinary adherent placenta with a placenta accreta. In the former there is simply a failure to separate for various reasons, such as failure of the uterus to contract properly, as in atony, or implantation of the placenta over a

noncontractile portion of a uterus, as in cases of large intramural fibroids. In placenta accreta, we often find a history of endometrial disease, adherent placenta or repeated curettages, and because of the previously damaged or atrophied endometrium, the decidua basalis is thin or absent and the villi penetrate deeply into the uterine wall and are in intimate relation with the muscle fibers. It is evident that placental separation over this area is impossible, as the normal spongy layer does not exist. Hirst states that adhesions of the placenta to the uterus occur once in every 312 cases, but that they are usually slight and manual removal is easy, while Polak places the incidence of placenta accreta about one in 6,000.

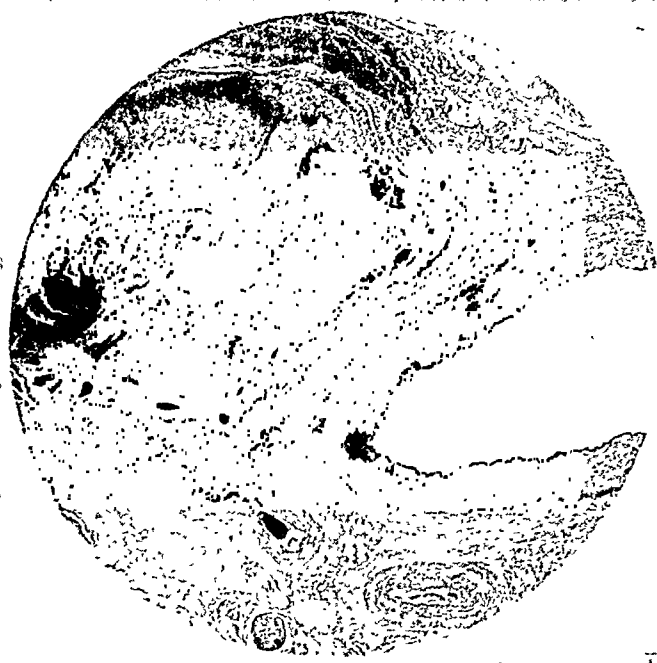


Fig. 8.—Photomicrograph of the left femoral vessels, showing a normal artery and a thrombosed vein. This thrombus is of more recent formation than that in Fig. 7, consisting principally of blood clot with a few new capillaries near the intima. Organization is just beginning.

Despite occasional good results I feel that, in view of our knowledge of the pathology of placenta accreta and the dangers incident to its manual or instrumental removal, there is little justification for this course, and, once the diagnosis is confirmed, the uterus should be packed when necessary and hysterectomy then performed.

Complete gangrene of the uterus is very rare, a search of the literature of the last fifteen years showing only one such instance. This followed an attempt at criminal abortion and was reported by Fort in 1912. The uterus had been severely traumatized and, through the resulting gangrenous tissue, a six and one-half months' fetus had been extruded into the peritoneal cavity. A subsequent Porro operation failed to save the patient's life.

Gangrene of the extremities, following parturition or pelvic operations, is mentioned in the textbooks and fairly frequently in the literature and is of considerable interest. Wormser, in 1904, reported 58 cases of puerperal gangrene of the lower extremities, in which he found the arteries alone involved in 40 cases, the veins in 13, and both in 5. Stein, in 1924, published a most interesting paper on this subject, which brought out the following points: (a) It is always difficult to know the seat of obstruction from the symptoms and physical signs, but an early onset following delivery or operation is most likely to be of arterial origin and a late onset venous; (b) a rapid onset with pallor and an absence of swelling indicates an arterial lesion, and produces a dry gangrene; (c) a sudden onset, with marked edema and cyanosis, shows a venous block and produces a moist gangrene. but, if the onset be more gradual and the swelling only moderate, with a slight discoloration, it is then difficult to be sure of the seat of the thrombus.

The symptoms are quite similar whatever the etiology of the obstruction may be; a sensation of "pins and needles" followed by severe shooting pains and then pallor, or cyanosis, is finally followed, in a varying length of time, by death of the parts. A disappearance of the arterial pulsations takes place more or less rapidly due to actual blocking of the artery by the thrombus, or, in those cases in which the veins are diseased, by the inability of the blood to return, thus indirectly obstructing the arteries as effectively as if an actual thrombus were present in them.

The prognosis is always grave and, even if the condition of the patient permits amputation following the appearance of a line of demarcation, a mortality rate of 60 per cent is to be expected. Embolotomy has been attempted in a few instances and, in those cases in which the seat of the thrombus was known and immediate operation performed, there have been a few successful results following the removal of the thrombus and the washing out of the artery. In indicated cases it is justified and can later be followed by amputation if it fails.

In the case just reported, infection was undoubtedly present in the uterus before the patient entered the hospital, but was probably held in check by a well-formed leucocyte zone. Following the destruction of the latter, however, by the operative trauma, an extensive infection of the uterine sinuses occurred with a resulting thrombophlebitis. This spread to the veins, causing a block of the circulation and a resulting gangrene of the uterus. Further spread by extension of the thrombi to the numerous veins in the pampiniform plexus and then to the external iliac and so to the femoral veins then ensued; first, on the left and later on the right side. Only at autopsy, however,

were we sure of the seat of the obstruction, for we had believed the trouble to be in the arteries. The blood stream infection probably occurred secondarily, due to the contact of the blood with the infected thrombi.

Because of the strict limitations imposed for the autopsy, the further tracing of the pelvic vessels and their branches was not attempted. A study, however, of the venous system of the lower extremities and pelvis leads us to conclude that, although a guess only can be hazarded as to the extent of involvement on the right side, on the left side there was a thrombosis of the femoral, external iliac, and anterior branch of the internal iliac, but not of the posterior branch or of the common iliac veins. The tubes and ovaries were not involved because of their independent circulation; the right ovarian vein emptying directly into the vena cava and the left one into the left renal vein.

REFERENCES

- (1) *Stein, A.*: AM. J. OBST. & GYNEC. 9: 959-605, May, 1925. (2) *Tennant, C. E., Wilson, R. E., and Craig-Sullivan, H.*: Colorado Med. 22: 145-148, April, 1925. (3) *Walchand, M.*: Schweiz. med. Wchnschr. 55: 898-899, Sept., 1925; Abst. J. A. M. A. 85: 1436, Oct., 1925. (4) *Polak, J. O., and Phelan, G. W.*: Surg. Gynec. Obst. 38: 181-185, Feb., 1924. (5) *Cooper, St. C.*: J. Arkansas M. Soc. 21: 95-96, Oct., 1924. (6) *Andress, C. J.*: J. A. M. A. 82: 1780, May, 1924. (7) *Barrett, W. D.*: Canad. M. A. J. (8) *Fort, F. T.*: Kentucky M. J., Bowling-Green. 10: 79-81, 1911-1912. (9) *Riesman, D., and Longaker, D.*: Proc. Path. Soc. Phila., N. S. 14: 8-11, 1911. (10) *Pool, E. H., and McGowan, F. J.*: Arch. Surg., Chicago. 8: 763-771, 1924.

90 EIGHTH AVENUE.

THE TREATMENT OF UTERINE INJURIES*

WITH A REPORT OF SEVEN CASES

BY LEO S. SCHWARTZ, M.D., F.A.C.S., BROOKLYN, NEW YORK

THE term uterine injuries is used advisedly for it is my intent to consider both perforation and rupture of the uterus. The purpose of this presentation is, first, to add to the records another series of instances of uterine injuries, and secondly, to evaluate from this though limited series of cases the result of conservative surgical treatment.

As this is a recital of personal experiences, and not a bibliographic review, I shall not burden you with statistics, except to state that A. B. Davis, in a review of 148,000 deliveries at the Lying-In Hospital over a period of thirty-seven years, found only 184 ruptured uteri.

The incidence of perforations of the uterus is more difficult to estimate, for there is no definite information on this subject. This lack of information may be explained by the fact that many cases of per-

*Read before the Brooklyn Gynecological Society, March 2, 1928.

forated uteri are not recorded, when the puncture has been made by a sound during operation or during attempted criminal abortion.

The cases in this series may be grouped as follows: four cases of perforation and three cases of rupture of the uterus. Of the four instances of perforation, two were complicated by intestinal injuries, both due to attempted criminal abortions, one case due to the introduction of a foreign body for the purpose of inducing abortion and one case caused by attempted curettage for an incomplete abortion. Of the three cases of ruptured uteri two were during labor, one of which was complicated by the escape of the placenta into the abdominal cavity; one of these three cases was caused by attempted extraction of a large submucous fibroid. Of these seven patients six were operated upon and recovered; one patient, who had a ruptured uterus, was not operated upon, and died.

The first case of uterine injury that came under my observation was that of a woman, twenty-two years old, married, who was admitted to my service at the Jewish Hospital on September 14, 1918, with the following history: that on the morning of her admission to the hospital the patient had an abortion performed and immediately after the curettage she was seized with severe abdominal cramps. The physician who referred the case to me stated that during the curettage he pulled down a loop of small intestine into the vagina which he immediately returned into the abdomen and packed the vagina with iodoform gauze.

On admission to the Hospital, the patient's temperature was 102°, and the pulse 110; the abdomen was tender and rigid from the level of the umbilicus down. On removal of the vaginal packing, the cervix showed an old laceration with a closed external os. The uterus and adnexa could not be palpated on account of the abdominal rigidity. The physician's positive assertion that he had recognized the intestine in the vagina, and the local findings, determined my course for an abdominal exploration.

On opening the abdomen the pelvis was filled with blood and the uterus was small and presented no evidences of pregnancy. There was a perforation through the fundus about 5 cm. wide. The mesentery of a small loop of ileum was split longitudinally and detached. The peritoneal coat of the intestines was denuded in several places; the largest area measured about 7 cm. in length. The uterine perforation was repaired, and the denuded surface of the intestines was covered with the edges of the torn-off peritoneum. To such places as could not be covered by the peritoneum, a purse string suture was applied. The mesenteric rent was then repaired. Two cigarette drains were inserted behind the uterus and the abdomen closed. For two days after operation the pulse remained between 120 to 130 but the temperature not higher than 100.6°. The drains were removed on the third day, but on the fourth day the temperature rose to 102°, the pulse remaining at 100. The patient's temperature persisted at 103.6° for two days, then dropped to normal. The patient was discharged on the fourteenth day after operation with a well-healed abdominal wound excepting for a small granulating area at the site of the drains. The uterus was slightly enlarged, in good position, rather fixed, and the pelvis free of any exudates. This patient was seen in December, 1919, when she complained of lower abdominal pain. The uterus was dextroverted and moderate bilateral parametritis was present. Under appropriate treatment, the parametritis resolved. August 27, 1924, she again con-

sulted me stating that in 1920 she had had a spontaneous, six months' miscarriage. The findings at this time showed a dextroverted uterus but no parametrial involvement.

The second case of uterine injury that came under my observation is that of a young woman, twenty years old, married, who was admitted to my service at the Jewish Hospital on January 12, 1920, with the following history: that on the morning of January 12 she had a curettage performed. In the course of this procedure a placental forceps was inserted into the uterus for the purpose of removing the products of the undesired conception, but the operator was unhappily confronted with the victim's entrails presenting in the vagina. He immediately stopped the operation and packed the vagina with iodoform gauze. I saw this patient at the physician's office within half an hour after the occurrence of this accident. The patient complained of slight abdominal cramps, but otherwise was apparently comfortable. She was transported from the doctor's office in an automobile and without any discomfort walked up the flight of stairs leading to the hospital.

On admission the temperature was 97° and the pulse, 100; the abdomen was flaccid and sensitive in the pelvic zone. The W.B.C. was 19,000 with 89 per cent polys; R.B.C. 3,850,000 and 80 per cent hemoglobin. After an antemortem statement had been obtained for legal purposes, the patient was taken to the operating room.

On removal of the vaginal packing a loop of discolored small intestine was found in the vagina. The diagnosis now being obvious, the abdomen was immediately opened through a median incision. There was no blood or free fluid in the peritoneal cavity. The uterus was enlarged and was perforated to the extent of 3 cm. in the right border of its anterior aspect about the level of the internal os, and a loop of almost gangrenous intestine had been pulled through this opening. The continuation of this loop of bowel was detached from its mesentery and measured 60 cm. in length. The anterior blade of the right broad ligament was torn to the extent of 5 cm. involving the anterior peritoneal reflection of the bladder. The loop of intestine was then extricated from the uterine opening and the mesentery ligated. The intestine was clamped at both ends of the loop and resected. The free ends were then ligated and inverted with purse-string sutures, and a side-to-side anastomosis performed. The uterine wound was sutured and covered by the bladder peritoneum. Two cigarette drains were inserted behind the uterus.

Postoperatively, the temperature ranged between 99° and 101° for the first five days, then rose to 103° for a few days. One drain was removed on the second day, and the other about the fifth day. There was a very profuse discharge from the wound which gradually subsided and the wound was completely healed at the time of the discharge. Ten days before discharging the patient, an x-ray study of the gastrointestinal tract revealed that there was no evidence of local stasis, pocketing or angulation.

On discharge, the abdominal wound was healed except for a small sinus at the lower angle; the uterus was small, retroposited and fixed by an insensitive exudate at the base of the right broad ligament.

The interesting features of this case are: first, the extent of the injury; second, the comparative comfort and lack of symptoms; third, the magnitude of the operation; and fourth, the conservation of the pelvic organs.

Of the two cases of perforation of the uterus without intestinal injury, the first one was that of a woman, thirty-three years old, married, para iv, who was admitted to the gynecologic service of the United Israel-Zion Hospital on November 15, 1923, with the following history: she expected her menstrual period on November 19, 1923, and being disappointed by its nonappearance, was led by fear

of pregnancy to insert an ivory crochet needle into the cervix. During this experiment she suddenly felt the needle slip from her hand. Soon after the accident a bloody vaginal discharge appeared and persisted. Excepting for occasional abdominal cramps and pain in the vagina on walking she experienced no discomfort. On the day prior to her admission to the hospital she had one chill.

On admission her temperature was 100°; pulse 90; blood count showed total white cells, 9,200 and 79 per cent polynuclear cells. Examination revealed moderate tenderness in the lower part of the abdomen; a lacerated pelvic floor and cervix; and an anteflexed, retroposited, soft uterus with sensitiveness in the left fornix. On the second day at the hospital her temperature dropped to normal and remained so. Because of the absence of marked abdominal symptoms and the element of doubt concerning the disappearance of the crochet needle into the abdominal cavity, the patient was kept under observation for several days. On November 18, a bedside radiographic examination revealed an indefinite shadow in the right iliac fossa. The radiographist, being in doubt as to the correctness of the plate, advised another examination. On November 25, a second x-ray examination revealed a definite, long shadow in the right iliac fossa. There being no doubt now as to the presence of the crochet needle in the abdominal cavity, an operation was advised. Repeated bimanual examinations without anesthesia as well as bimanual examinations under anesthesia failed to confirm the presence of a foreign body in the abdomen.

On opening the peritoneum an ivory crochet needle, 15 cm. long and 5 mm. in diameter, was found lying free in the abdominal cavity with its business end on the cecum and its base against the left ascending ramus of the pubis. The uterus was retrocessed and from about the middle of the fundus, a single fine adhesive band, extending to the omentum and crossing the needle, was observed. The adhesive band was easily separated and a probe readily passed into the uterine cavity at this point. This evidently was the site of the perforation through which the needle had entered the abdominal cavity. The perforation was then repaired. There were no other evidences of pathology than the omental adhesion just described. This patient made an uneventful recovery.

This case presents these interesting points: first, self-inflicted perforation of a vicus by a foreign body and its escape into the abdominal cavity; and second, the absence of abdominal symptoms or infection. The latter may be due to the fact that the patient claims to have thoroughly boiled the needle before inserting it.

The second instance of perforation of the uterus without intestinal injury, occurred during a curettage for an incomplete abortion. This patient, aged thirty-one years, was admitted to the gynecologic service at the United Israel-Zion Hospital on September 19, 1927; married four and a half years; two previous cesarean sections, three and one-half and two and one-half years, respectively; a curettage for incomplete abortion about eight months ago was performed. The patient had her last menstrual period on July 19, 1927. About August 20, the patient realizing the possibility of pregnancy, resorted ineffectually to the common medicaments for artificially terminating pregnancy. About September 14, she began to bleed rather profusely. This continued in a lesser degree for about a week. On the day of her admission to the hospital, the patient had a rather severe hemorrhage for the relief of which a curettage was attempted at her home. During the course of this procedure, a placental forceps was introduced which, on removal, was found to contain a piece of omentum. The patient soon showed all evidences of shock and was immediately transferred to the hospital.

On admission the patient looked very pale, a cold perspiration covering her entire body; heart sounds were only of fair quality; pulse weak, with slight tenderness in the pelvic region. Blood pressure was 64/40; blood count showed R.B.C. 3,250,000; HGB. 50 per cent. The patient was immediately given a hypodermoclysis of 1000 c.c. of saline and expectant treatment resorted to for the relief of the

shock. Five hours after her admission to the hospital the patient's pulse was 72; blood pressure 80/46, and the blood count showed a R.B.C. 3,100,000; HGB. 65 per cent. A diagnosis was made of perforation of the uterus with injury to the omentum.

The patient's condition now warranted surgical intervention. On opening the abdomen the omentum was found in the pelvis with a few of its strands attached to the uterus. About an ounce of blood clot was removed and some fresh blood was found oozing from a wound through the peritoneum covering the anterior surface of the right broad ligament. This wound was in the anterior surface of the uterus about the level of the internal os. The perforated area was cleaned, freed from blood and the raw surface approximated with catgut sutures. The torn peritoneum was then sutured so that it covered the uterine wound. The omentum, which was traumatized, was ligated and resected. The uterus was found to be the size of about a six to eight weeks' pregnancy, quite irregular, and had two small fibroids, one in each cornu. There were two scars on the anterior surface of the uterus the results of the previous cesarean sections. The abdomen was closed without drainage. A transfusion of 400 c.c. of blood was given the patient. She reacted very well from the operation. Two days later the patient was suddenly seized with severe pain in the left chest, with difficulty in breathing. A diagnosis at this time was made of a pulmonary infarct. The following day her condition improved and continued to improve, excepting for a collection of serosanguinous fluid in the wound, which was opened and drained.

The patient was discharged on the twenty-eighth day after operation with a well healed abdominal wound, and a retroflexed uterus with an insensitive slight exudate in the right fornix.

Of the three ruptured uteri, the first case that came under my observation was a uterine injury caused by the delivery through the vaginal route, of a submucous fibroid after a spontaneous full-term labor. This patient, thirty-four years old, para v, was admitted first to the obstetric and immediately transferred to the gynecologic service at the Jewish Hospital, on December 14, 1918. The history of the patient is that on the night before admission to the hospital she had a precipitate labor. About half an hour after delivery she was suddenly seized with cramp-like pains in the lower abdomen simulating labor pains and accompanied by a rather brisk hemorrhage.

Examination on admission revealed a fundus reaching to about three fingers' breadth below the umbilicus, very firm and somewhat irregular. Vaginal examination disclosed a submucous fibroid presenting itself through a completely dilated cervix. The admission temperature was 100°, and the pulse 120. Blood count was 30,800 total white cells; 86 polys; 12 lymphocytes; 2 eosinophiles; total red count, 3,330,000; hemoglobin, 55 per cent.

The patient was given a blood transfusion of 750 c.c. and with the aid of repeated doses of pituitrin she extruded the fibroid into the vagina. Vaginal examination at this time showed that the fibroid had passed through the cervix and presented itself in the vagina. Her general condition having improved considerably, it was now thought best to remove the tumor. On the following day, the patient was taken to the operating room, and by gentle traction from below and pressure from above, a degenerated, submucous fibroid, ovoid in shape, 14 by 8 by 5½ cm. was delivered. Immediately after the removal of the tumor a tube and ovary appeared in the vagina. On digital exploration of the uterus a large tear in the right side was found. The abdomen was immediately opened and the uterus found to be enlarged with a rent beginning at the right cornu and extending downward along the lateral wall for a distance of about 7 to 8 cm. A total hysterosalpingo-oophorectomy was rapidly performed.

The patient's convalescence was a rather stormy one, the temperature, with slight variations, persisting at 103.5° and the pulse running from 120 to 140. The blood count was 28,000 total white cells; 88 polys; 12 lymphos; 2,250,000 red cells; HGB. 55 per cent. This condition continued for about five days. On the sixth day postoperative, an infected wound was opened and drained, following which both the temperature and pulse gradually came down to normal. On about the eighth day postoperative, a second transfusion of 350 c.c. of citrated blood was given. The patient's recovery thereafter was rapid. She was discharged on the twenty-third of January, 1919, the thirtieth day after operation.

The condition on discharge presented a well healed abdominal wound, a multiparous introitus and a well healed vaginal stump which was held up high, and a pelvis free from exudates.

This patient consulted me in 1923 at which time she was suffering from a tapeworm and excepting the usual menopausal syndrome, the physical findings were negative.

After reviewing the postoperative course of this case the question presented itself whether a repair of the injury would have resulted not only in a smoother convalescence but also in retaining the female organs where nature intends them to be. This consideration has guided me in the management of the subsequent cases.

The second case in this group is that of a ruptured uterus after a spontaneous full-term delivery which was not operated upon. This patient, thirty-five years of age, was admitted to my service at the United Israel-Zion Hospital on November 27, 1922. The history, as obtained from the family physician, is that she had four previous labors, all ending in instrumental deliveries, although none of the babies were over seven pounds. The patient had been in active labor for over four hours before the arrival of the physician at 1:30 A.M. on the twenty-fifth of November, 1922. He found that the cervix was fully dilated and the membranes intact. During his vaginal examination the membranes ruptured, about five gallons liquor amnii escaped, and a breech presented. The patient was given one-half c.c. of pituitrin hypodermically. According to the physician's statement about two and one-half hours elapsed between the administration of the pituitrin and the expulsion of the baby. The breech was delivered without any difficulty. As the baby was anencephalic there was no difficulty encountered in the delivery of the after-coming head. About five minutes following the expulsion of the child the placenta was easily expressed. No undue bleeding was noticed.

A few minutes following the expulsion of the placenta the patient suddenly complained of faintness and shortness of breath. Her condition became very alarming. She was placed in the Trendelenberg posture and given morphine, following which her condition improved. The same day the patient complained of epigastric distress. Her pulse, which had previously been imperceptible, was now 96. I saw this patient that evening and found her very comfortable, except for a complaint of slight pains in the right side of the lower part of the abdomen. The pulse was 90; slight tenderness in the right iliac fossa; lochia was normal, and rectal examination revealed a closed cervix and a well contracted uterus with some sensitiveness in the right fornix. A diagnosis of a possible incomplete tear in the lower part of the right side of the uterus was then made and expectant treatment advised. On November 27, the patient began complaining of abdominal cramps which were accompanied by vomiting.

On admission to the Hospital, the temperature was 102.4°; pulse, 160; heart sounds of very poor quality. Examination revealed marked abdominal distension with visible peristalsis; marked tenderness in both flanks with rigidity in the

outer part of the right rectus. The vomitus was yellowish in color without any odor. Vaginal examination showed a slight bloody discharge; cervix patent, admitting one finger; uterus firm and to the left. Blood examination was R.B.C. 2,080,000, W.B.C. 8800, polys 79 per cent, HGB. 30 per cent. A diagnosis of ruptured uterus was now made but surgical intervention on account of the patient's condition considered inadvisable. Her condition improved somewhat for the next twenty-four hours, then she suddenly began to bleed per vaginam. A transfusion of 250 c.c. of blood was given but her condition rapidly grew worse and the patient expired; this was the fourth day after the occurrence of the accident.

Postmortem vaginal exploration revealed a large rent in the right lateral uterine wall with a loop of bowel protruding. There was considerable blood in the peritoneal cavity.

The cause of the rupture in this case may be ascribed to the over-distension of the uterus by the hydramnios aided very likely by the administration of pituitrin.

It seems to me now that despite the risk of infecting a patient it would be wiser in cases where uterine injury is suspected to explore the uterus even in the absence of ideal aseptic conditions. An early diagnosis in this case followed by prompt treatment may have saved this patient's life.

The third case in the group of ruptured uteri was complicated by the escape of the placenta into the peritoneal cavity. This patient, twenty-nine years old, was admitted to my service at the United Israel-Zion Hospital on May 19, 1924. She had had two normal pregnancies and deliveries, eleven and nine years ago, respectively. Her last menstrual period occurred on the fourth of September, 1923, making the estimated date of her confinement on or about June 11, 1924. Three days prior to her admission the patient was delivered of a premature still-born infant. The placenta was retained; and, since there was no undue bleeding, no attempt by intrauterine interference or external manipulation was made to deliver it. On admission to the hospital, the patient was found to be in poor condition. The temperature was 102.2°, her pulse 120. The abdomen was distended and sensitive, and she suffered from continuous retching and vomiting. On rectal examination the cervix was found about two fingers dilated, and in the lower uterine segment a soft mass was palpable which was taken as the retained placenta. The lochia was scant and malodorous, and there was no excessive bleeding. The ligated end of the cord presented at the vulva. A diagnosis of retained placenta and pelvic peritonitis was then made.

The following day a transfusion of 560 c.c. of blood was administered. The blood count was 4,232,000 R.B.C.; 60 per cent HGB.; 18,000 W.B.C.; 88 polys, and 12 per cent lymphos. At this time the umbilical cord could not be seen at the vulva nor in the vagina. The mysterious disappearance of the cord and the patient's condition determined the necessity of immediate exploration of the uterus for the purpose of removing the retained placenta.

The patient was taken to the operating room; and, on vaginal examination, it was found that the cord had retracted beyond the cervix and that there was free fluid in the culdesac. A posterior colpotomy was performed which resulted in the escape of free blood from the pelvic cavity and demonstrated the presence of the placenta in the abdomen to the left and posterior to the uterus which had a tear along its left border. The culdesac was drained with iodoform gauze and a diagnosis of ruptured uterus with escape of placenta into the peritoneal cavity was now manifest, but the patient's condition at this time did not warrant further surgical interference. Following this procedure the peritoneal symptoms subsided and the general condition of the patient improved.

On the next day, May 21, a laparotomy was performed. On opening the abdomen a rent in the lateral uterine wall, about 10 cm. in length, extending from the left cornu in a vertical direction downward to the level of the internal os, was found. The placenta was dark in color, very spongy, almost liquid in consistency. The right side of the pelvis was completely plastered down by exudate. The placenta was removed and the rent in the uterus exposed. The uterus itself was fixed. Hysterectomy in the presence of infection, as evidenced by the conditions previously described, was deemed not only inadvisable but disastrous. The tear in the uterus was therefore repaired by the use of doubled sutures of No. 2 chromic catgut. The approximation of the torn edges was difficult on account of the friability of the uterine wall. After closure of the tear the uterus was attached to and covered by parietal peritoneum so as to make this organ extraperitoneal. The abdomen was closed and drained. Immediately following the operation a transfusion of 400 c.c. of blood was given.

For about forty-eight hours following the operation the patient suffered considerably from abdominal distension. The temperature hovered continuously between 101° and 102° for twelve days during which period there was profuse purulent discharge from the abdominal wound as well as from the vagina. Her general condition, however, continued to manifest a steady improvement; and, on the twenty-ninth day after operation, the patient was allowed out of bed. On the twenty-third of June a vaginal examination disclosed the posterior colpotomy wound almost healed but a mass was palpable in the culdesac.

After dilation of the posterior colpotomy wound considerable pus and a strip of iodoform gauze escaped. The patient was discharged on the fifty-second day after operation. Examination at this time revealed a good general condition; abdominal wound well healed, except for a small granulating area at its lower angle; and the posterior colpotomy wound almost entirely healed with some induration around it. The uterus was involved, held up high and to the left, with no palpable exudate present. A blood count at this time showed 5,200,000 R.B.C.; 65 per cent HGB.; 12,000 W.B.C.; 64 polys; and 36 lymphocytes.

The interesting features in this case are: first, the cause of rupture which I was unable to establish; second, the escape of the placenta through the uterine rent into the peritoneal cavity and its retention for five days; and third, the conservative operative procedure.

An important causative factor in the perforation of the uterus in the early stages of pregnancy is the malposition of the organ, the uterus being usually in retroflexion. A sound or dilator is introduced and passed through the anterior wall of the uterus. The operator believing that he has entered the cavity of the uterus follows this by the introduction of a placental forceps or a curette and in his attempt to extract what he believes to be the uterine contents, delivers instead intraabdominal contents, usually small intestine or omentum.

The causative factors of full-term injuries of the uterus are numerous and varied. In the cases of this series the causative factors have already been described.

The treatment of uterine injuries may be briefly stated as prophylactic and curative. The prophylactic treatment consists in the proper determination of the correct position of the uterus and the exercise of careful instrumentation. When a uterine sound has passed to a greater distance than the supposed stage of the pregnancy one should at once suspect a perforation. In the full-term pregnant uterus all intra-

uterine manipulations must be carefully executed; the use of pituitrin must be well indicated.

The surgical treatment should be instituted as quickly as possible after the occurrence of the calamity, and as the greatest danger is peritoneal infection, the cases operated on within twelve hours after injury has occurred have the best chance for recovery.

The surgical treatment should consist of the repair of all intestinal or omental injuries. Conservation and not the extirpation of the uterus and appendages should be the rule. I believe that I have demonstrated at least to myself that the conservative treatment of uterine injuries is not only feasible but is successful. In five of these cases in which conservative surgery was practiced not only have the patients recovered but have retained their menstrual and generative functions.

849 PARK PLACE.

(For discussion, see page 123.)

REPORT ON SEVENTY-SIX CASES OF ECTOPIC GESTATION

By J. L. BUBIS, M.D., F.A.C.S., CLEVELAND, OHIO

(From the Gynecological Department of Mount Sinai Hospital, Cleveland, Ohio)

IT IS only about fifty years ago that Parry¹ expressed the accepted theory of his time when he said that the accident of ectopic gestation was almost always fatal and that there were no reliable means to combat its dangers. Since that time, there is nothing in the surgical field that has shown such brilliant progress as the diagnosis and treatment of ectopic pregnancy.

Any pathologic or abnormal condition of the female genitals may be a focus or cause of this accident. In our series, 2 cases followed vaginal incision and drainage done four and five years previously. Hydrosalpinx on the opposite side was found several times and one followed a Rubin test for sterility. Williams² found evidence of inflammatory reaction in all specimens examined, and these were bilateral in all cases where both tubes were removed.

Ectopic gestation may occur during any time of the child-bearing period. Our youngest patient, who had had a child seven months previously, was nineteen years old. The oldest patient was forty-one years old.

TABLE I.—PARITY

SINGLE	I	II	III	IV	V	VI	VII
1	31	16	14	9	4	0	1

It is interesting to note that thirty-one of our series, or over 40 per cent, were primiparae.

The diagnosis of early ectopic gestation is very difficult to make. In many cases, with typical textbook symptoms, we found no extra-uterine pregnancy; and again, we found this condition when the symptoms and history suggested other disorders.

Many patients have been curetted under the impression that they were suffering from an incomplete abortion which subsequently proved to be an ectopic pregnancy. Ten, or 13 per cent, of our series had been curetted (prior to admission to the hospital) from six days to eight weeks before the true condition was recognized.

TABLE II.—CASES CURETTED FOR SUPPOSED MISCARRIAGE

NUMBER	1	2	3	4	5	6	7	8	9	10
No. of days before true diagnosis	6	9	10	11	12	14	19	28	42	56

Our experience coincides with that of Oastler;³ namely, that in many cases tenderness of the mass is out of all proportion to its size and density, and that traction on the cervix or active manipulation of the uterus generally aggravates the pain and tenderness. These symptoms may disappear for days or weeks and recur with exacerbations until some marked changes take place. Nine of our patients gave the above history.

At the beginning of rupture or tubal abortion there may be symptoms of an acute abdomen of moderate severity without any definite findings in the adnexal regions. There may be a slight elevation of temperature, pulse rate, and leucocytosis, with very little change in the sedimentation time. The hemoglobin or the number of red blood cells may not be affected.

When a massive hemorrhage suddenly occurs, signs of shock and collapse, distention of the abdomen, and at times unconsciousness are present. The peritoneal reaction, so-called "peritoneal kick," is usually present. Contrary to Schumann¹ and DeLee,⁴ we found shifting dullness in at least 7 of our 76 cases. Cullen's sign, i.e., dark discoloration at the umbilicus was noted three times. Twelve patients were in shock on admission to the hospital.

There is another type in which there are slow repeated attacks of pain and internal bleeding, and a gradual increasing anemia and weakness. Vaginal examination shows the pelvis filled by an indefinite tender mass, which seems to encompass the pelvic organs. Jaundice, nephritis, and fever are not unusual complications at this stage.

The following terms were used by the patients to describe the types of pain that they suffered: sharp, bearing down, tearing-like pain; intermittent labor-like, dull ache, severe cramp, extreme agony, gas-like pains, pressure sensation, feeling of weight in the rectum, bladder, or back. These pains often occur during sleep, while walking,

riding, during intercourse, or after eating. They frequently radiate to the epigastrium, shoulder, thorax, or to the back.

Pain in the bladder region, frequent micturition, vaginal and rectal discomfort, or pain radiating down the thighs is not uncommon. Constipation, obstipation or diarrhea, and rectal tenesmus were also noted.

The right side was affected in 45 and the left in 31 cases. Occasionally the uterine artery on the affected side was more easily palpated than on the opposite side, but we do not feel that is a pathognomonic sign.

Thirty-nine of our series (i.e., 51 per cent) complained of vaginal bleeding, which varied from a scant, intermittent "show" to profuse bleeding (often clotted) which lasted several weeks. This is a very significant sign and frequently leads to a mistaken diagnosis of an incomplete or a threatened abortion.

Ectopic pregnancy must be differentiated from: (1) early uterine pregnancy, with an enlarged corpus luteum of the ovary; (2) threatened miscarriage; (3) rupture of a graafian follicle, with internal hemorrhage;⁵ (4) torsion of a tube and ovary; (5) torsion of an early pregnant uterus, complicated by soft fibroids and recent omental adhesions (author's case); (6) ovarian cyst with twisted pedicle; (7) acute or subacute salpingitis; (8) hydrosalpinx; (9) acute appendicitis; (10) rupture of gastric or duodenal ulcer, and from (11) ureteral or renal colic.

There are two outstanding features in the diagnosis of extrauterine pregnancy.

1. Pain, as described above. This combined with the history of a possible pregnancy, an indefinite fullness and tenderness in the pelvis, combined with

2. A bloody "show" which does not appear at the regular or expected menstrual period, should be suggestive of extrauterine pregnancy. The presence of clotted particles of blood on vaginal puncture is indicative of pelvic hemorrhage so frequently associated with ectopic pregnancy and may help to decide the diagnosis.

As previously stated, the diagnosis of an unruptured or partially ruptured ectopic pregnancy is at times very difficult to make, but fortunately the treatment for all conditions with which it might be confused is an operation. The only exception would be an acute salpingitis.

The advance in the treatment of ectopic gestation has reduced the mortality from 85 to about 5 per cent and has markedly decreased the morbidity, chronic invalidism, and the period of convalescence. There were 4 deaths in our series; 1 from peritonitis, 1 from cardiac failure with pulmonary edema, 1 from shock, and 1 patient, who had suppurating salpingo-oophoritis at the same time, died of Streptococcus hemolyticus peritonitis. Most of the patients leave the hospital

from two to three weeks after the operation with no worse effects than is usual with operative cases. These remarkable results can be attributed to prompt operative procedure and to the wonderful effect of blood transfusion plus the routine treatment of shock. Thirteen patients were transfused just before or during the operation and 4 were transfused immediately after.

If the patient is in a dangerous condition, only the affected tube is removed; otherwise we have been in the habit of taking care of all lesions present. We have performed a number of curettements in order that the decidual reaction in the cases might be studied by Dr. B. S. Kline, pathologist of Mt. Sinai Hospital. There has always been a marked difference of opinion by various authorities as to the diagnostic value of the decidual reaction in uterine scrapings. I believe that the conclusions which he has drawn and presented in a companion paper deserve careful consideration.

We do not irrigate the abdomen after the operation, but we do remove most of the blood clots. Drainage is seldom used, as the peritoneum can usually take care of the remaining blood and serum. If an accumulation forms in the culdesac, it is very often absorbed in a short time. If it becomes infected, it is then well localized and circumscribed and may be readily evacuated by vaginal incision and drainage.

After operation all patients are kept on either strict or modified peritonitis treatment for from twenty-four to forty-eight hours, depending on their condition. This treatment consists of the use of Fowler's position, saline infusions (1500 to 3000 c.c. per day), occasionally 500 c.c. of 5 to 10 per cent glucose solution intravenously, hot stupes to the abdomen, and enough morphine-sulphate by hypodermic injection to keep the patient comfortable and to hold the respirations below 20 per minute.

The following complications occurred in our series: 2 cases of each of the following: parotitis, phlebitis, peritonitis; 1 each of edema of the lungs, intestinal obstruction, pelvic abscess; and one case of acute mania.

CONCLUSIONS

1. Ectopic pregnancy may occur at any time in the childbearing age.
2. There is a greater percentage of ectopic gestation in primiparae than is usually suspected.
3. Pain, as described above, is the most constant and significant symptom.
4. Irregular and prolonged bleeding, suggesting a threatened abortion, often occurs, in contrast to the infrequent occurrence of vaginal bleeding in early uterine pregnancy.

5. Immediate operation, except in cases of infection, plus transfusion and careful after-care, is the safest and best method of treatment.

REFERENCES

(1) *Schumann, E. A.*: Monograph on Extrauterine Pregnancy, D. Appleton & Co., 1921. (2) *Williams, C. D.*: Surg. Gynec. Obst., 1908, vii, 526. (3) *Oastler*: Quoted by Schumann. (4) *DeLee, J. B.*: Textbook on Obstetrics, 1918, p. 404. (5) *Bubis, J. L.*: Ovarian Hemorrhage, American Physician, Feb., 1922, p. 113.

7016 EUCLID AVE.

THE FETAL MORTALITY IN BREECH PRESENTATIONS. IS PROPHYLACTIC EXTERNAL VERSION ADVISABLE?*

BY E. L. KING, M.D., AND A. H. GLADDEN, JR., M.D., NEW ORLEANS, LA.
(From the Departments of Obstetrics and of Gynecology, Tulane University of Louisiana, School of Medicine)

The fetal mortality in breech presentation is variously estimated.

DeLee¹ says that it is between 6 and 15 per cent, and states that with proper care it should not be over 5 per cent. in uncomplicated cases. Bumm² puts the figure at 15 per cent. According to Williams³ it is between 10 and 15 per cent in primiparae, with a lower rate in multiparae. Polak⁴ says that it is at least 10 per cent in primiparae, but claims that with skilled assistance it should be almost as low as in vertex presentations. Similar figures are given by Shears,⁵ Edgar-Vaux,⁶ and Tweedy, Wrench and Solomons.⁷ Wallieh, of Paris,⁸ quotes statistics collected by Hegar, which show a 40 per cent fetal mortality in rural practice; in the Clinie Baudelocque, on the contrary, it is given as 3.5 per cent, while in the Clinie Tarnier, the figure for frank breech cases is given as 7 per cent. Irving and Goethals,⁹ in a series of 235 breech deliveries occurring in the Boston Lying-In Hospital over a period of fourteen years, found the fetal mortality to be 9.78 per cent (12.7 per cent for the primiparae and 7.8 per cent for the multiparae). Pierson,¹⁰ in 122 cases at the Sloane Hospital for Women, reports the fetal mortality as 12 per cent. Gibberd,¹¹ however, thinks that the figures usually quoted are much too low, at any rate, as far as average medical practice is concerned. He reports 135 uncomplicated breech cases delivered in the Guy's Hospital District. He does not state whether these were hospital or home deliveries, but one would infer the latter to be the case. Of these patients, 29 were primiparae, with a primary fetal mortality of 28 per cent and an additional neonatal mortality of 3.5 per cent, and 106 were multiparae with a primary fetal mortality of 14 per cent and a neonatal death rate of 1 per cent in addition. He states that this is to be considered as an exceptionally unfortunate series if the generally accepted figures are correct, or else that these figures are much too low. In substantiation of the latter view, he quotes figures collected by him from six different hospitals, which showed, in 136 uncomplicated cases, a primary fetal mortality of 26 per cent, and an additional neonatal mortality of 6 per cent.

*Read before the New Orleans Gynecological and Obstetrical Society, Meeting of April 19, 1928.

It is generally stated that the chief dangers to the fetus are asphyxia and compression of the cord; hence, the time honored maximum of eight minutes from the birth of the umbilicus to the delivery of the head.

The more recent texts do not insist so strongly on this point, though Tweedy, Wrench, and Solomons⁷ state that if the cord circulation stops for four minutes the child will probably die. Holland,¹² on the contrary, feels that the fetus is not any the worse for fifteen or twenty minutes of cord compression. Potter, as is well known, extends the limit of safety to fifteen or more minutes, and stated to me that in one instance he had delivered a live baby twenty-six minutes after the cord pulsation had ceased during the performance of a version. It is now a matter of general knowledge that many of the fetal deaths occurring during or shortly after breech delivery are due to birth injuries and not to anoxemia; Holland, for instance, states that tears of the tentorium and cerebral hemorrhage are almost constantly found in dead babies delivered by the breech. Pierson, in his review of 122 primary breech deliveries of viable babies at the Sloane Hospital for Women, reports 18 fetal deaths (12 per cent). In 87 viable babies delivered by version, the fetal mortality was 18 (26 per cent). In 17, or 47 per cent, of these 36 fetuses, spinal cord hemorrhage was found at autopsy, while 4 showed partial or complete rupture of the spinal cord. In 14, or 38 per cent, one or more fractured vertebrae were found, and in 9, or 25 per cent, cerebral hemorrhage, varying in degree from moderate to severe, was noted. Pierson quotes Brown as stating that cerebral hemorrhage is ten times more likely to occur in breech delivery than in delivery by the vertex, and that hemorrhage into the adrenals is twenty-two times more frequent in the former. One of the fetal deaths reported in this paper was due to a rupture of the left adrenal.

The management of the delivery is generally considered to be responsible for these birth injuries rather than the presentation itself. Many feel that rigid adherence to the eight-minute rule, with hasty and unskillful manipulations, not infrequently leads to fetal death. This is especially stressed by Holland.

Pierson states that two errors in judgment stand out in the series reported by him: (a) hurried conduct of the delivery, or, as he well phrases it, frantic haste rather than deliberate skill; (b) misjudgment of the pelvis, as exemplified by the fact that 50 per cent of the pelves in the version cases and 6 per cent in the primary breech series were abnormal. He also stresses two errors in technic: (a) failure during delivery to accommodate the long axis of the child to the pelvis axis, thereby causing dangerous angulation; (b) failure to accommodate the long diameters of body, shoulders, and head to the long diameters of the pelvis, resulting in too much traction and in undue suprapubic pressure.

It appears then, that some revision in the technic heretofore employed in the management of breech delivery is indicated, and this tendency is noted in the recent literature as well as in the recent revisions of the various textbooks on obstetrics.

Holland thinks that it is entirely wrong to hasten delivery of the aftercoming head, but that we should deliver it gently and gradually. He also lays great emphasis on the value of episiotomy as a means of saving the fetal head from excessive stress. Mecker and Bonar¹³ state that sacral anesthesia is of great value

in breech presentations on account of the marked relaxation of the perineum thus obtained. Wallieh and other writers speak enthusiastically of the dilatation of the vagina by hydrostatic bags. A preliminary "ironing out" of the vagina is recommended by Potter and others. The various texts consulted all recommend expectant treatment during the delivery, without undue haste, together with the avoidance of traction as much as possible. True, Shears states that as soon as the breech appears at the vulva, the delivery is to be hastened as much as possible, and Tweedy and his coauthors state that the child's life depends on the speed and skill of the delivery, but we may safely assume that these writers are referring to skillful expedition and are not advocating rough maneuvers. Some writers, notably DeLee and Edgar-Vaux, recommend forceps to the aftercoming head in difficult cases. Irving and Goethals, at the Boston Lying-In Hospital, tested out the policy of delivery as soon as the cervix was fully dilated. Their method was as follows: surgical anesthesia, the bringing down of one foot or both feet, if possible (using the Pinard maneuver in frank breech cases), extraction of the arms anteriorly, and delivery of the head either by suprapubic pressure combined with the Mauriceau method or by the use of forceps in an occasional instance. Thirty cases were managed in this manner in the course of a year; thirteen were primiparae and seventeen were multiparae. One baby was lost in each series, giving a total fetal mortality of 6.6 per cent (7.7 per cent in the primiparae and 5.8 per cent in the multiparae). The rate for several years preceding this test was 11 per cent. The authors state that this method has been followed in the main in this hospital since these observations were made, with a definite lowering of the fetal mortality.

Even the lowest of these mortality figures for breech deliveries, however, is much higher than the fetal death rate in vertex presentations, hence we find that prophylactic external version has long been recommended by many authorities, and is attracting renewed interest at present.

Gibberd, in view of the high fetal mortality in his series, heartily recommends the method and reports his experience with it. In 232 cases, he failed 58 times. Of these 17 babies later turned spontaneously, in 18 instances no further attempt was made, while in 18 others a second attempt was successful in eight patients. The babies which were turned sustained a primary fetal mortality of 2 per cent and a neonatal death rate of 1.4 per cent. The author feels that the optimum time for the performance of the version is between the thirty-second and the thirty-sixth week. If tried earlier, the position is especially liable to recur, while after the thirty-sixth week the operation becomes increasingly difficult the nearer we approach term. It is well to note that no case of prolapsed cord or of placental separation was encountered in the patients upon whom this version was performed. Ryder¹⁴ reports a similar series, consisting of 49 patients under observation before the onset of labor, and three who were not seen until labor had begun. Of the 49, external version was performed on 29 patients; of these, one recurred and was delivered by the breech, one was delivered by cesarean section, and the other 27 were delivered as vertex presentations. The attempt at external version was unsuccessful in four instances, and in the 16 patients remaining, for various reasons, it was not tried. All these 49 babies lived. In the three patients seen after the onset of labor, the version was successfully performed in one instance. In all the versions on primiparae the new position was permanent, but the breech presentation recurred in several of the multiparae.

More recently, Bartholomew¹⁵ reported his results with external version in a personal series of 54 breech presentations. In 13 cases the attempts were not successful, but in 6 of these the baby later turned spontaneously before term was reached, so that only 7 of the children were delivered by the breech. In his last 37 cases, after some experience was gained, the version was successful in 35. In one of the unsuccessful attempts the turning was probably tried too early (at the seventh month), and in the other patient a dense area of scar tissue in the lower right abdominal quadrant (following an operation for suppurative appendicitis) greatly hampered the operator in his manipulations. Experience of the writer and others showed that there is no advantage in trying to retain the baby in the corrected position by pads and bandages. In this series, no babies were lost, nor did premature separation of the placenta or premature rupture of the membranes occur. He agrees that the most favorable time is during the eighth month. If the first attempt fails, one or more additional trials may be in order.

The technic of this procedure is simple. The patient's bladder and rectum should be empty. The dorsal position is employed, with the lower extremities flexed to relax the abdominal muscles. Some writers prefer the Trendelenberg posture. At times, especially in primiparae, an anesthetic, preferably ether, is necessary in order to secure the necessary relaxation. The breech is raised from the pelvis with one hand, and is carried toward the iliac fossa on the side to which the baby's back is pointing, while the head is brought down on the opposite side by the other hand, thus maintaining the body in a position of flexion. In some instances this procedure will fail and version in the opposite direction will be successful. Gibberd, Reyder, and Bartholomew all state that no untoward results were noted in their series, such as premature separation of the placenta, prolapse of the cord, rupture of the membranes, etc. However, a case of fetal death following external version has recently been reported by Fruhinholz,¹⁶ who thought that the fatality was due to pressure of the fetal head against the placental vessels at the insertion of the cord. DeLee,¹⁷ in commenting on this paper, stated that he knew of two deaths following this procedure. Hence, it is essential that the utmost gentleness be employed, and that force be not employed to overcome resistance, if encountered.

In an attempt to determine the local fetal mortality in breech presentations, we have analyzed the cases cared for during the past few years in the Charity Hospital and the Touro Infirmary. Patients with babies weighing less than five pounds have been eliminated, as a fetal death from prematurity cannot in fairness be ascribed to the presentation or to the method of delivery, and conversely a successful delivery of a premature infant is no testimony as to the accoucher's skill. Patients delivered of macerated babies have likewise been eliminated, as well as cases of multiple pregnancy. In the Charity Hospital we studied the records of 78 patients delivered in the white obstetric service. Thirty-one were primiparae, with a fetal death rate of two, or 6.4 per cent, and 47 were multiparae, with a fetal mortality of 6, or 12.8 per cent. At the Touro Infirmary we reviewed the records of 80 cases, 33 being multiparae and 47 primiparae. There were four fetal deaths in each series, giving a fetal mortality of 9.3 per cent for the latter and 12.12 per cent for the former, with a rate of 10 per cent for the series as a whole. Combining the two

series, we find a total of 158 cases, with 16 fetal deaths, or 10.12 per cent; in the group comprising the primiparae there were 78 cases, with six fetal deaths, or 7.7 per cent, while in the second group of 80 multiparae there were ten fetal deaths, or 12.5 per cent.

These figures are somewhat better than we had anticipated, especially as regards the work at the Charity Hospital, where most of the cases under consideration were admitted in labor, had had no prenatal care, and in some instances had been sent in because of the inability of the attendant to accomplish delivery in the home. The results may be due to the fact that we have insisted that breech cases are not easy, and with few exceptions the patients have been delivered under the direct supervision of a member of the visiting staff, or by the staff member personally. The Touro series consists of two groups of cases, private patients and patients admitted from the free clinic. Some of the former were cared for by specialists, some by general practitioners, some by general surgeons. The clinic cases were delivered by the members of the obstetric staff of the clinic, or by the resident staff under their direct supervision. The outstanding feature of both series, as well as could be ascertained from the records, was that the majority of the patients, especially the primiparae, were delivered under anesthesia by some form or modification of breech extraction. It appears that the policy of leaving the case almost entirely to nature was not popular. It is interesting to note that in both series the fetal mortality was lower in the primiparae than in the multiparae. This is probably due to the increased weight of the dead babies born of the multiparae; seven of these ten were weighed, and the average was found to be 8 pounds, 14 ounces, with three weighing 10 pounds or more. The dead babies in the series of primiparae averaged 7 pounds, 10 ounces in weight ($1\frac{1}{4}$ pounds less than in the multiparae), and the largest one weighed 9 pounds, 13 ounces.

These 16 fetal deaths, studied in an effort to discover the causes of the fatalities, give us the following information. In the primiparae, one baby, weight $6\frac{2}{3}$ pounds, was born dead, after extraction under anesthesia. The notes stated that the heart tones were heard shortly before the onset of labor, but no further observations as to the heart tones were recorded. The other 5 babies died at periods varying from three to five days after delivery. One baby was subjected to autopsy, and intracranial hemorrhage was found. Another, born after a very difficult extraction, with futile attempts at forceps extraction of the after-coming head, died on the fifth day, with fracture of the frontal and occipital bones (confirmed by radiologic examination), and hemorrhagic disease of the newborn. Of the 3 other deaths, 2 were diagnosed clinically as due to hemorrhagic disease of the newborn, and 1 to cerebral hemorrhage. No autopsy was performed on

these babies. Of the 10 fetal deaths occurring in the series of 80 multiparae, two occurred in women, each of whom gave a history of stillbirth in the preceding (and only other) pregnancy. This information should have put the obstetrician on his guard. On one chart the pelvic measurements were recorded as normal, while no note as to this point was found on the other record. Another baby, weighing 10 pounds, died three days after delivery; at autopsy, the death was found to be due to hemorrhage following rupture of the left adrenal. Two other babies were dead when the patients were first seen. Two deaths were due to the great difficulty in extracting the after-coming head; in one instance there was also extension of the arms. Two others were born dead after extraction for frank breech presentation; in one instance, the baby weighing $11\frac{1}{2}$ pounds, the notes state that delivery as soon as the cervix was fully dilated would probably have saved the infant. In the tenth case, the baby, weighing 7 pounds, 5 ounces, was born precipitately, was resuscitated, and died a few hours later. No cause could be assigned, and no autopsy was obtained.

Considering these results in our local institutions, should we recommend prophylactic external version? We might remark that we have attempted it only a few times with an occasional success, as most of the patients delivered by us or under our supervision were emergency cases at the Charity Hospital, and were not seen until they were admitted in labor. However, it appears to us, after this review of the local situation and of the experiences of others, that it is advisable to attempt to turn these babies by the method above outlined, even though the fetal mortality in this series in no way approaches the figures given by Gibberd. It would seem that external version would be especially indicated in the work of the occasional accoucheur, whose fetal mortality in breech cases will naturally be higher than that of the specialist, particularly if the delivery is to be conducted in the home without adequate facilities. Under these very circumstances, however, it is least likely to be tried, chiefly because, on account of faulty prenatal care, the diagnosis is frequently not made sufficiently early. Hence it would appear that in our teaching we should continue to stress early obstetric diagnosis, and should in addition train our students in the performance of prophylactic external version.

To recapitulate, then, we would recommend an attempt to turn the baby by external manipulations between the thirty-second and thirty-sixth weeks, when the diagnosis of breech presentation is made that early. If the version fails or if the patient is not seen until labor has begun, we feel that the best results are obtained by breech extraction under surgical anesthesia with ether. In our opinion, this is best begun in the case of a full breech when the buttocks begin to emerge from the vulva, while in frank breech and in footling cases (on ac-

count of the danger of prolapsed cord) it is well to undertake it as soon as the cervix is fully dilated. Colpencyris by a hydrostatic bag or the ironing out of the vagina will be of great assistance, and episiotomy is wise in most primiparae. Forceps to the after-coming head will at times be a lifesaving procedure.

REFERENCES

- (1) *DeLee*: Principles and Practice of Obstetrics, Philadelphia, 1928. (2) *Bumm*: Grundriss zum Studium der Geburtshilfe, Munich, 1922. (3) *Williams*: Obstetrics, New York, 1923. (4) *Polak*: Manual of Obstetrics, New York, 1922. (5) *Shears*: Obstetrics, Normal and Operative, Philadelphia, 1920. (6) *Edgar*: Practice of Obstetrics (Vaux' revision), Philadelphia, 1926. (7) *Tweedy, Wrench, and Solomons*: Practical Obstetrics, Oxford Press, 1925. (8) *Wallich*: Éléments d'Obstetrique, Paris, 1921. (9) *Irving and Goethals*: AM. JOUR. OBST. AND GYNEC., 1926, xi, 80. (10) *Pierson, R. N.*: Surg., Gynec. and Obst., 1923, xxxvii, 802. (11) *Gibberd, G. F.*: Jour. Obst. and Gynec., Brit. Emp., 1927, xxxiv, 509. (12) *Holland, Eardley*: Report on the Causation of Fetal Death, London, 1922. (13) *Meeker and Bonar*: Surg., Gynec. and Obst., 1923, xxxvii, 816. (14) *Ryder, Geo. H.*: Surg., Gynec. and Obst., 1923, xxxvii, 660. (15) *Bartholomew, R. A.*: AM. JOUR. OBST. AND GYNEC., 1927, xiv, 648. (16) *Fruhlinsholz*: Ztschr. f. Geburtsh. u. Gynäk., 1927, xcii. (17) *DeLee*: Pract. Med. Series, Obst. and Gynec., 1927, p. 272.

(For discussion, see page 130.)

ANEMIA IN PREGNANCY*

BY CHARLES EDWIN GALLOWAY, B.S., M.D., F.A.C.S., CHICAGO, ILL.

WE ARE constantly endeavoring in our practice of prenatal care to give the pregnant woman advice that will be of benefit to her in every way. There is some tendency, however, to give the subject of toxemia the greater attention, neglecting many other things of equal importance. The problem of anemia in pregnancy has been very inadequately treated in the literature. Of the little which has been written the greater part deals with the so-called pernicious anemia of late pregnancy and the puerperium. Only ninety references could be found relative to the subject and all but ten of these dealt with this variety.

Walter Channing was the first to describe the pernicious anemia of pregnancy in 1842. Most of the cases recorded are found in the German and French literature. Esch reviewed the German literature exhaustively in his articles covering the years 1911 to 1927. Schmidt of Detroit has made a special study of the subject. Larrabee and Minot (Boston), Rowland (Cleveland), Kerwin (St. Louis), G. H. Schneider, Oettingen and Alder of Germany have also added to the knowledge of the condition.

The short study herein presented does not include any cases of so-called pernicious anemia of pregnancy but deals entirely with the so-called physiologic anemia. Gram of Denmark, Kerwin and Collins

*Read at a Meeting of the Chicago Gynecological Society, March 16, 1928.

of St. Louis, Thompson of Johns Hopkins, and Poul Kühnel of Germany are some of the most important contributors to this subject. Kühnel's article covers a very thorough study of the blood in fifteen normal pregnant women, recording their blood findings every two weeks during pregnancy and also at intervals of one to three months for one year after delivery.

It has been shown also that we not only have the common physiologic anemia and the pernicious-like anemia of pregnancy but that a certain number of cases of true pernicious anemia start with pregnancy. In Cabot's 1200 cases of pernicious anemia 434 were in women and 35 of these started with pregnancy.

Etiology.—From the literature it would seem that anemia during pregnancy is the result of the destruction of maternal blood cells by the chorion, presumably to allow the blood elements to be taken up into the fetal circulation. Some evidence of this destruction can be found in the liver and spleen and by an increased amount of iron in the urine. Strahl, Bounet, Kolster, Hofbauer, Wychel and Payer have all demonstrated absorption of hemoglobin and erythrocytes by the ectoderm cells of the chorion.

R. Freund, Mohr, Polano and Rucher have all found lipid substances in the placenta. Mohr and Freund assume that these hemolyzers normally produce solution of maternal erythrocytes in the placenta.

It seems logical to assume that the blood-forming organs of the body attempt to replace the blood destroyed and if they fail to respond properly anemia will result.

Alder believes that the so-called pernicious anemia of pregnancy occurs only on the basis of a primarily injured, poorly functioning bone marrow. Esch, however, studied carefully the reports of forty-eight cases and in only 35 per cent could he assume the presence of a functionally injured bone marrow.

Diagnosis.—The diagnosis of anemia is, of course, made only by examination of the blood. Many pregnant women, having a well-developed anemia, show no pallor. Even where pallor is evident a blood count should be made because pallor and anemia are not always associated.

The pernicious-like type of anemia occurs only in the last few months of pregnancy or during the early puerperium. Over two hundred cases have been reported. They have all apparently been cases that have had little or no prenatal care. Esch compiled 23 cases with a mortality of 70 per cent. Schevlov compiled 52 cases with a mortality of 65 per cent. Seitz reported 43 cases with a mortality of 50 per cent. Aubertin reported 53 cases and stated that recovery was very rare. There is extreme pallor with a yellow tint to the skin, extreme weakness, no loss of weight, but instead, edema, diarrhea with colorless stools, low fever, vomiting, sore mouth, achlorhydria

and the blood picture is almost identical with true pernicious anemia. Labor is generally premature, of short duration, with very little pain and scant bleeding. Both Heim and Offergeld state that the baby is free from anemia while in true pernicious anemia it never escapes.

Report of Blood Examinations.—The blood examinations here presented were all done on my private cases but do not constitute a deliberate, systematic study of the subject of anemia. The figures represent a compilation of 364 routine blood examinations on 228 consecutive cases delivered over a period of fourteen months ending November 9, 1927. Sixty-eight of the 228 cases had not had an examination of the blood during pregnancy so that only 160 cases are recorded. Sixty-two cases had only one examination, 46 had two examinations and 53 cases were examined three or more times.

Eighty-seven patients were examined during the first twelve weeks of pregnancy. The average hemoglobin of these 87 examinations was 72.5 per cent. The average red cell count was 3,630,000.

Seventy-seven patients were examined between the twelfth and the twenty-eighth week of pregnancy. The average of 84 hemoglobin estimations was 70 per cent. The average of sixty-six red cell counts was 3,560,000.

Sixty-nine patients were examined between the twenty-eighth week and term. Seventy-two hemoglobin estimations gave an average of 71 per cent. Forty-one red cell counts gave an average of 3,820,000.

It has been the general belief that anemia was more apt to occur in early pregnancy with a gradual rise to near normal at the ninth month. Such a statement was made by Osler based on a study by W. L. Thompson in William's Clinic at Johns Hopkins. The above findings do not bear this out. The average count was no better in the last trimester than during the first or second notwithstanding the treatment which will be discussed later. Moreover, some of the most severe cases of anemia developed during the last trimester. Kerwin and Collins made thirty estimations of hemoglobin in the first trimester with an average of 83 per cent, eighty-eight in the second trimester with an average of 83 per cent, and eighty-six in the third trimester with an average of 82 per cent. This also shows a uniform hemoglobin for the three trimesters, although relatively high. H. C. Gram records 58 examinations during pregnancy with an average hemoglobin of 71 per cent for the first trimester, 72 for the second, and 79 for the third. Kühnel, in recording the study of 15 pregnant women where examination was made every two weeks, says there was a progressive anemia until the sixteenth to the twenty-second week, that this low mark was stationary until the thirtieth to the thirty-second week when improvement occurred and the curve reached its height at the thirty-fourth week. He also stated that the hemoglobin curve made a more pronounced drop than the erythrocyte curve.

Taking the entire 243 hemoglobin estimations made by me during all months of pregnancy, the average was found to be 71 per cent. The average red cell count taken from 194 examinations under the same conditions was found to be 3,660,000.

A letter was recently sent out to 75 of these patients asking them to come into the office for blood examinations while they were not pregnant and 39 responded. They were all over three and one-half months away from delivery and 33 out of the 39 were over five months from delivery. The average hemoglobin was 85 per cent and the average red cell count was 4,710,000.

The records of 33 examinations were found that had been made during the first twelve postpartum days. The average hemoglobin was 80 per cent and the average red cell count was 4,450,000. Three cases of postpartum hemorrhage were omitted from this group.

Twenty-five examinations were made at the eighth week postpartum when it is customary to make a physical examination. The average hemoglobin of these 25 examinations was 81 per cent and the average red cell count was 4,440,000.

Alder examined 11 patients during pregnancy and again during the puerperium. In pregnancy the average hemoglobin was 50 per cent and the average red cell count was 3,680,000. In the puerperium the average hemoglobin was 73 per cent and the average red cell count was 4,430,000. Kühnel's records show a hemoglobin and red cell count on the tenth postpartum day almost as high as the sixth month after delivery. The findings of these two authors and the figures given above all correspond and show that the anemia of pregnancy disappears very shortly after delivery.

Treatment.—The majority of the patients in this group of 160 who showed a tendency to become anemic were given treatment. No rule was followed but generally if the hemoglobin dropped below 70 per cent a preparation of iron and arsenic was given by mouth three times a day with meals and diet containing considerable iron was prescribed. If no improvement occurred after a month or more of this treatment they were given a series of exposures with the ultraviolet light at two-day intervals and at the time of each treatment iron was administered with a hypodermic syringe, generally intramuscularly. Twenty-seven out of 41 cases that had to be treated in this manner showed satisfactory improvement. Four of these patients became severely anemic again, however, before delivery occurred and were again given the same treatment and with the same satisfactory results. Four of the 41 remained the same, three became more anemic in spite of this treatment and no records were available on the results in seven. The three cases that did not respond to treatment were not severe. All three had a hemoglobin between 60 per cent and 70 per cent.

The most effective treatment of the pernicious anemia of pregnancy seems to be repeated injections of small amounts of whole blood, or repeated, small transfusions. Claiborne Smith had very good success in eight cases with the administration of dilute hydrochloric acid. Aubertin who reported 53 cases stated that recovery, though rare, occurred only where the uterus was empty. Only a few authors, however, recommend induction of labor.

CONCLUSIONS

1. The majority of women, when pregnant, have a lower hemoglobin and fewer erythrocytes per cubic millimeter.
2. This anemic condition will, in the majority of cases, disappear within two weeks after delivery.
3. The use of ultraviolet light together with the intramuscular injection of iron will help prevent severe anemia in pregnant women.

REFERENCES

- (1) Alder, A.: Ztschr. f. Geburtsh. u. Gynäk., 1924, lxxxvii, 505.
- (2) Aubertin, C.: La Presse Méd., January 5, 1924, xxxii, 13.
- (3) Audebert, Bonhoure, and Galy-Gasparrou: Bull. Soc. d'obst. et de gynéc. de Paris, 1926, xv, 386.
- (4) Bardy, Emile: Etude sur la guérison de l'anémie pernicieuse gravidique, Paris, 1924, p. 203.
- (5) Bauereisen: Zentralbl. f. Gynäk., 1911, xxxi, 1181.
- (6) Beckman, M.: Monatschr. f. Geburtsh. u. Gynäk., December, 1921, lvi, 119.
- (7) Benda, R.: Zentralbl. f. Gynäk., Aug. 23, 1924, xlviii, 1857.
- (8) Berard, C. L.: Contribution à l'étude des états anémiques graves des suites de couches (anémies posthémorragiques exceptées), Lyon, 1913.
- (9) Bertino, A.: Ann. di ost. e gin., No. 10, Florence, 1908.
- (10) Beyer-Gurovitsch, Dina: Über perniziöse anämie in gravidität und puerperium, Zürich, 1912.
- (11) Beyer-Gurovitsch: Inaug. Diss., Zürich, 1912.
- (12) Boissard, A., and Verdoux: Bull. Soc. d'obst. de Par., 1909, xii, 308.
- (13) Bourret, M.: Bull. Soc. d'obst. de Par., 1911, xiv, 494.
- (14) Bustos, Moron R.: Prensa med. argentina, Buenos Aires, 1925-1926, xii, 1148.
- (15) Caruso, Samml.: klin. Vorträge N. F. No. 378.
- (16) Channing, Walter: New England Quar. Jour. Med. and Surg., 1842-43, p. 157-58.
- (17) Clauser, F.: Zentralbl. f. Gynäk., 1925, xlix, 752.
- (18) Delnuen, J.: Contribution à l'étude de l'anémie pernicieuse progressive chez les femmes enceintes, Paris, 1913.
- (19) Devraigne and Blum: Bull. Soc. d'obst. et de gynéc. de Paris, 1926, xv, 114.
- (20) Drexel, Th.: Med. Klin., 1926, xxii, 961.
- (21) Drygas: Deutsch. med. Wehnschr., 1902, p. 543.
- (22) Esch, P.: Arch. f. Gynäk., 1927, cxxix, 788-806.
- (23) Esch, P.: Deutsch. med. Wehnschr., Oct. 19, 1911, xxxvii, pt. 2, 1943.
- (24) Esch, P.: Ztschr. f. Geburtsh. u. Gynäk., Sept., 1916, lxxix, 8.
- (25) Esch, P.: Zentralbl. f. Gynäk., March, 1921, xlv, 341.
- (26) Esch, P.: Zentralbl. f. Gynäk., April 3, 1926, l, 857.
- (27) Esch, P.: Zentralbl. f. Gynäk., Oct. 23, 1926, l, 2738.
- (28) Findley, P.: Am. Jour. Obst., August, 1918, lxxviii, 262.
- (29) Fitz-Patrick, Gilbert: Surg., Gynec. and Obst., 1923, xxxv, 72.
- (30) Gallupe, H. I.: and O'Hara, D.: Bost. Med. and Surg. Jour., Jan. 31, 1924, cxc, 161.
- (31) Garipuy: Bull. Soc. d'obst. et de gynéc. de Par., 1926, xv, 397.
- (32) Garipuy and Claude: Bull. Soc. d'obst. de Par., 1908, xi, 70.
- (33) Gram, H. C.: Ugeskr. f. Laeger, Copenhagen, Dec. 23, 1920, lxxxii, 1609.
- (34) Halir, O.: Med. Klin., April 3, 1925, xxi, 498.
- (35) Heim, K.: Zentralbl. f. Gynäk., May 26, 1923, xlvii, 818.
- (36) Hilgenberg, F. C.: Zentralbl. f. Gynäk., October 17, 1925, xlix, 2336.
- (37) Hirsch, C., and Kuppel: Arch. f. exper. Path. u. Pharmakol., 1923, xeviii, 106.
- (38) Hoskin, T., Jenner, and Ceiriog-Cadle, Enid: Lancet, Feb. 26, 1927, cexii, p. 433.
- (39) Jousséwitch, L.: Etude clinique et hématologique de 4 cas d'anémie grave pendant la grossesse observés à la Maternité de Genève, Genève, 1911.
- (40) Jungmann, P.: München. med. Wehnschr., 1914, lxi, 414.
- (41) Kaminer, Siegfried: Fortschr. d. Med., Berlin, 1911, xxix, 6.
- (42) Kerwin, Wm. and Collins, Leslie: Am. Jour. Med. Sc., 1926, clxxvii, 548.
- (43) Koumane, Marie: Anémie pernicieuse

grossesse (essai de pathogénie), Montpellier, 1906. (44) *Kühnel, Poul*: Ztschr. f. Geburtsh. u. Gynäk., 1927, xc, 511. (45) *Labendzinski, F.*: Über perniciöse anämie in der schwangerschaft, München., 1912. (46) *Larrabee, R. C.*: Am. Jour. Med. Sc., September, 1925, clxx, 371. (47) *Maffre-Bangé, A.*: Diagnostic et traitement de l'anémie perniciouse dans la grossesse, Montpellier, 1912. (48) *Magnes, A.*: Contribution à l'étude des anémies "pernicieuses" de la grossesse (à propos d'un cas d'anémie grave suivi d'amélioration très sensible après l'accouchement), Toulouse, 1910. (49) *Manton, W.*: Trans. Sect. Obst. Gynec. and Abdominal Surg., Am. Med. Assn., 1921, p. 262. (50) *Matthes, M.*: Lehrbuch der Differential Diagnosis innerer Krankheiten, Berlin, 1923, Julius Springer, p. 412. (51) *Naegeli*: Über puerperale rezidivierende schwere Anämie zuletzt mit Osteomalazie als innersekretorische Störungen, München. med. Wehnschr., 1917, lxiv, 1513. (52) *Naegeli, O.*: Blutkrankheiten und Blutdiagnostik, 4 Aufl., 1923, Deutsch. Arch. f. klin. Med., 1917, cxxiv, 237. (53) *Narayana, U. L.*: Antiseptic, Madras, 1919, xvi, 279. (54) *Oettingen, K. J. V.*: Zentralbl. f. Gynäk., 1924, xlviii, 1506. (55) *Offergeld, H.*: Monatschr. f. Geburtsh. u. Gynäk., September, 1926, lxxiv, 245. (56) *Osler, William*: Brit. Med. Jour., Jan. 4, 1919, i, 1. (57) *Palm*: Monatschr. f. Geburtsh. u. Gynäk., 1901, xiv, 605. (58) *Petersen, E.*: Arch. mens. d'obst. et de gynéc., January-March, 1918, vii, 1. (59) *Plauchu, M.*: Un cas d'anémie perniciouse de la grossesse, Bull. Soc. d'obst. de Par., Nov. 11, 1912, xv, 913. (60) *Plicot, A.*: Contribution à l'étude de la pathogénie et du diagnostic de l'anémie perniciouse progressive des femmes enceintes, Paris, 1895. (61) *Reist, Alfred*: Schweiz. med. Wehnschr., 1926, lvi, 781. (62) *Reist, Alfred*: Zentralbl. f. Gynäk., 1926, l, 1496. (63) *Reist, Schweig*: Med. Wehnschr., 1926, xxxii, 781. (64) *Rowland, V. C.*: Jour. Am. Med. Assn., Feb. 2, 1924, lxxxii, 372. (65) *Rud, E.*: Ugesk. f. Laeger., Sept. 4, 1924, lxxxvi, 653. (66) *Rumpf, E.*: Deutsch. med. Wehnschr., April 6, 1923, xlix, 438. (67) *Runge, M.*: Ztschr. f. Geburtsh. u. Gynäk., 1879, iv, 75. (68) *Sachs, E.*: Ztschr. f. Geburtsh. u. Gynäk., 1909, lxiv, 336. (69) *Sachs und Winter*: Die Indikationen z. keinstlichen Unterbrechung d. Schwangerschaft, Berlin, 1918, p. 271. (70) *Saniter*: Zentralbl. f. Gynäk., 1899, xix, 571. (71) *Sauvage and Vincent, C.*: Bull. Soc. d'obst. et de gynéc. de Par., 1913, ii, 156. (72) *Schevelev, Avigael*: Contribution à l'étude de l'anémie perniciouse de la grossesse, Nancy, 1913. (73) *Schmidt, H. B.*: Surg., Gynec., and Obst., 1918, xxvii, 596. (74) *Schneider, G. H.*: Monatschr. f. Geburtsh. u. Gynäk., March, 1924, lxxv, 321. (75) *Schneider, G. H.*: Ztschr. f. Geburtsh. u. Gynäk., 1927, xc, 487. (76) *Schupbach, A.*: Cor. Bl. f. Schweiz. Aerzte, 1913, xliii, 1535. (77) *Seitz*: Doderlein's Handb. d. Geburtshilfe II vol., München, 1924. (78) *Smith, Claiborne T.*: Surg., Gynec., and Obst., 1925, xl, 223. (79) *Spire and Perrin*: Bull. Soc. d'obst. et de gynéc. de Par., 1912, xv, 949. (80) *Tchertkoff, I.*: Contribution à l'étude des anémies graves de la grossesse, Paris, 1912. (81) *Vermelin, and Vignoul*: Bull. de la Soc. d'obst. et de Gynec., 1923, iv, 329. (82) *Vogt, E.*: Verhandl. der deutsch. Gesellsch. f. Gynäk., 1913, xv, 115, 249. (83) *Voron, and Gerest*: Bull. Soc. d'obst. et de gynéc. de Par., 1912, i, 909. (84) *Wagner*: Zentralbl. f. Gynäk., 1902, li, 1407. (85) *Weber, A.*: Deutsch. Arch. f. klin. Med., Aug. 18, 1909, xevii, 165. (86) *Weidenmann, M.*: Cor.-Bl. f. Schweiz. Aerzte, May 25, 1918, xlviii, 702. (87) *Wolff, Alfred*: Deutsch. med. Wehnschr., 1914, No. 13, 643. (88) *Zimmermann, R.*: München. med. Wehnschr., 1920, lxxvii, 898.

(For discussion, see page 136)

SOME PHYSIOLOGIC ASPECTS OF ECLAMPTIC TOXEMIA*

By LUCIEN A. LEDOUX, M.D., F.A.C.S., NEW ORLEANS, LA.

(From the Obstetrical Service of the Hotel Dieu, New Orleans)

OF THE complications of pregnancy, none seem to have been as extensively studied or written about as the toxemia occurring usually late in gestation. Its etiology remains unknown, but is the subject of relentless research. The treatment of choice tends to conservative management, distinctly noninterfering, with results that are most gratifying as compared to former methods, and as a consequence this mode of treatment appears to have become a fixture in our obstetric armamentarium.

Realizing that this subject has so many interesting and debatable angles, I will restrict my discussion to a consideration of this complication from the standpoint of some of its physiologic aspects adding such comments as I consider pertinent.

About seven years ago, dissatisfied with the results we were obtaining from the then generally accepted treatment of eclampsia, we began to apply ourselves to the study of these cases, prenatal, natal and postnatal, and made several observations, which not entirely new, were nevertheless very interesting.

It was noted that this toxemia occurred more frequently in the negro than in the white; in the latter, considered from the economic standpoint, oftener among the lower than the upper classes. Individuals of the stout and plethoric types were more prone to its development. Most significant was the fact that this complication occurred in less than 10 per cent of the maternity cases that were properly supervised during the prenatal period, and that when such symptoms did appear they were readily amenable to corrective and protective measures. Equally significant was the fact that whenever this toxemia became a serious complication it always responded to the same protective, corrective, and eliminative measures. We, therefore, seemed to be dealing with an entity whose cause is unknown, and which can be eliminated or controlled by a plan of treatment which as a whole sought to restore and equalize the several body functions.

It is a notorious fact that the average individual consumes a diet excessively high in protein, and the usual intake is twice as much as the body requirements. Poor hygiene, insufficient exercise, low fluid ingestion and improper diet all tend to constipation and the retention and concentration in the body of materials which first overload, and

*Read before the New Orleans Gynecological and Obstetrical Society, Meeting of April 19, 1928.

tax the various organs in a mechanical way, and finally furnish an additional burden in the form of toxic products or by-products with the resultant, inevitable breakdown of function.

These observations among others determined us to adopt the conservative treatment of eclampsia as a routine and this course was later followed by other obstetric services in the Charity Hospital.

Since then, additional observations have been made, based on the belief that the liver was the key to the solution of the question, and on the fact that it was the principal seat of abnormal postmortem finding, and because it seemed possible that the occurrence of eclampsia remained unexplained rather than undiscovered.

The changes incident to pregnancy tend to aggravate faulty personal habits, and if permitted to go uncorrected the patient comes to us with one or more symptoms of what we recognize as an impending toxemia.

The early picture then points more to a disturbance of physiology rather than to pathology. It is interesting here to review some aspects of the physiology of pregnancy, especially because in view of the common association of a high protein diet with constipation in the pregnant woman it appears that one or both may be the initial factor in the development of this toxemia. It is well to remember that the general metabolism shows a marked improvement during pregnancy, and that the katabolic processes are just as active as the anabolic. The maternal organs are called upon to take care of an added metabolism besides their own, the burden increasing with the advancement of pregnancy.

The liver, one of the organs prominently affected by this change, has several important functions: The elaboration and excretion of bile, the production of starch (glycogen) and sugar (glucose), the formation of urea, and finally, in my belief the most important, the conjugation of products of protein putrefaction.

This latter function converts the toxic products of the putrefaction of proteins into nontoxic compounds. Intestinal bacteria have a two-fold activity, fermentative and decompositive, and when the latter action on proteins is exaggerated it becomes a putrefactive process and certain toxic substances are elaborated; namely, acetic and lactic acids, and the aromatic substances, indol and skatol, cresol and phenol. These compounds are formed in the intestines and are absorbed and carried by the blood of the portal vein to the liver and in their passage through the capillaries of the liver, they are conjugated for the most part with potassium sulphate by the action of the liver cells and thus deprived of their toxicity.

Among the substances thus conjugated are indol, skatol, phenol, and cresol, and after absorption indol and skatol are oxidized to indoxyl and skatoxyl, and then combined with potassium sulphate giving rise

to potassium indoxyl and skatoxyl sulphate. All of these compounds then pass into the blood of the general circulation and finally are eliminated by the kidneys.

Potassium indoxyl sulphate is the source of the indigo-forming substance found in the urine, which is known as indican. Other compounds are likewise reduced in toxicity by the liver cells, though the method by which this is accomplished varies with the nature of the compound. The liver, therefore, presents a chemic defense against the entrance of more or less toxic agents into the blood of the general circulation.

Collectively, then, these appear to be the responsible factors: faulty hygiene, improper diet, concentration and retention due to low fluid intake and lack of exercise, constipation, intestinal putrefaction with its sequelae, an overproduction of indol, skatol, phenol, and cresol. An overwhelming of the detoxicating function of the liver with resultant necrosis from these toxins precipitates a disturbance of the remainder of hepatic function, which soon involves other organs and completes the transition to pathology. A toxemic picture of varying degrees presents itself.

The encouraging results recently reported with the administration of liver extract, a substance which seems to restore the hepatic balance, suggest that this explanation is at least tenable from the standpoint of detoxication.

Continuing our physiologic considerations, we recall that all proteins when metabolized yield a series of nitrogenous holding bodies which must be eliminated by the kidneys and the intestinal glands as well. The wear and tear of these organs will be proportional to the amount of urea and other materials which they are called upon to excrete, and if the kidneys fail to excrete these substances, some may become deposited in the tissues and give rise to certain constitutional disorders.

There is the added fact that the ammonium salts (the carbamate, carbonate, and lactate) increase in the urine when there is a destruction of the liver, and less urea can be formed. These salts are then excreted in larger quantities, which forcibly calls our attention to the physiologic embarrassment of liver and kidneys and to the interference with the important hepatic function of urea storage.

Finally, as a result of the loss of detoxicating power and of cell destruction, the glycogenolytic power of the liver is interfered with and this completes the physiologic breakdown of its function and its transition to pathology, which eventually involves the whole system.

Assuming, therefore, that these views are correct, it will be interesting to consider their relationship to the symptoms which suggest or typify eclampsia, and are grouped here in the order of their onset and severity.

Pulse Acceleration is an invariable accompaniment of this condition, most frequently the earliest sign, usually overlooked or not properly evaluated. A moderate increase in pulse rate is characteristic of a low grade of toxemia. This rate increase is seldom mentioned but is worth consideration, especially during the last trimester.

Hypertension.—This most frequent and earliest sign, in the light of our present knowledge, conclusively points to the existence of hepatic dysfunction. The satisfactory results obtained by numerous observers with liver extract in treating hypertension, actually induced Miller and Martinez of Pittsburgh to use it in cases of eclampsia, with results that are brilliant and apparently conclusive.

Reduction of blood pressure after the administration of a definite amount of this substance apparently is the result both of supplying the liver through this medium with material capable of strengthening its chemic defenses, and of restoring its detoxicating balance.

Headache is usually toxic in character, early in occurrence, and largely ascribable to the increase in blood pressure. It is of special significance when recurrent or continuous, and associated with one or more other characteristic symptoms.

Vertigo.—Like headache, vertigo is due to the toxemia plus the increased blood pressure, and suggests cerebral involvement with early edema. It frequently occurs when the toxemia has become fairly well developed, and its first appearance calls for a searching investigation.

Nausea and Vomiting.—In all probability it is toxic in origin and possibly due to a disturbance in duodenal digestion resulting from chemical changes in the biliary secretion due to a hepatitis.

Urinary Findings.—The principal anomalies consist in presence of albumin and casts. Too often this simple form of laboratory examination is omitted or neglected. The impression seems to prevail that the routine examination of a specimen once a month is sufficient for safety if albumin findings are negative. This false sense of security contributes largely to that class of cases referred to as the "fulminating type" of eclampsia.

The presence or absence of albumin, indican, intestinal putrefaction, acetone and diacetic acid, acidosis, bilirubinuria indicative of liver pathology, casts often without albumin, acute nephritis, etc., can be determined only by a complete macro- and microscopic examination of the urine.

It might be well to mention here that a differentiation between an eclamptic nephritis and a preconceptional nephritis has been made easier by the use of the bromsulphthalein dye as a test for liver function as recommended by Siegel. The dye retention is greater in eclamptic nephritis.

The test for liver function plus the urinary findings give us the laboratory line of demarcation between physiologic breakdown and its substitution by true pathology.

Edema of the Extremities.—When of toxic origin, the edema develops simultaneously with a nephritis and is soon followed by *edema of the face* which signalizes an advanced, generalized toxemia with severe renal involvement, appearing when the complication is moderately or severely advanced.

Uterine Hemorrhage is a sign not often mentioned but of great importance, especially if intermittent in type. It then suggests premature separation of the placenta as the result of toxic placental changes, and presages a premature stillbirth usually of a macerated fetus.

Dyspnea.—It is suggestive of myocardial changes and cardiac embarrassment appearing usually late in the clinical picture. It deserves more consideration than it has received in the past. The heart is the last of the organs in the eclamptic triad to succumb to the assaults of the toxemia.

Visual Disturbances.—An albuminuric retinitis or choked discs account for this symptom and, like dyspnea, develop as a rule late in the severe stage. The disturbance results from all the preceding pathologic changes with cerebral involvement and its appearance adds to the gravity of the case.

Coma, Convulsions.—More often than not they are terminal or near-terminal processes and result from uremia and intracranial pressure from cerebral edema. Broken cardiac compensation accounts for the presence of *pulmonary edema*.

One may notice that in developing and explaining the symptomatology there becomes evident a pyramiding of dysfunction, beginning in the liver, spreading to the kidneys, and finally including the heart with the inevitable result of a breakdown of function followed by the rapid development of truly pathologic conditions.

The superior mesenteric vein drains the intestinal tract all the way down to the rectum, emptying into the portal vein. Microscopically the portal venule distributes its branches through the hepatic lobule and anastomoses with the capillaries of the central vein which in turn empties into the hepatic vein.

The characteristic liver pathology in eclampsia consists in a peripheral, focal necrosis that is nearer to the portal than to the central venule. This anatomic fact suggests that toxins, carried from the intestinal canal into the liver through the portal system, cause the destruction of liver cells rather than a toxic substance formed in the liver itself and carried away through the central vein.

There are yet innumerable other possibilities. It may be that investigations of the behavior of lactic and acetic acids in the blood,

further studies of the urine, and of the manner in which the liver preserves its chemic defenses and detoxicating balance, will throw more light on the subject. The startling disappearance of certain symptoms and the rapid diminution of pathologic changes with restoration of function following the use of liver extract in sufficient amounts and at proper intervals, seem to indicate that eclampsia results primarily from a breaking down of normal liver function, the other changes being only dependent and secondary.

These reflections represent an attempt at explaining and correlating certain findings in the hope that they may form another step toward the solution of a vexatious problem. I am indebted to Dr. W. P. Gardiner, my former associate, for many of these observations.

CONCLUSIONS

1. Faulty hygiene, improper diet with constipation and intestinal putrefaction appear as predisposing factors.
2. There are indications that eclamptic toxemia primarily results from a physiologic breakdown beginning in the liver. *
3. The detoxicating function of the liver appears to be disturbed first, followed by interference with other functions.
4. The transition to pathology is progressive and rapid.
5. The pyramiding of symptoms and signs results from a progressive disturbance of physiology, followed by a substitution of pathology finally involving all of the organs. Liver, kidneys and the heart become especially affected, in the order here given.
6. Pulse acceleration and intermittent vaginal bleeding are two signs which should be added to the typical picture of eclampsia.
7. From the seventh month until term the parturient woman is called upon to take care of increasing katabolic changes.
8. Protecting the patient, by careful prenatal care, against overburdening of her physiologic functions and attempting to equalize the diminished detoxicating liver function are logical demands for proper prophylaxis against eclampsia.

817 MAISON BLANCHE BUILDING.

(For discussion, see page 130.)

TRAUMATIC PERFORATION OF UTERUS WITH SEVERANCE OF RECTUM*

REPORT OF CASE

By W. WORTHAM MAXWELL, M.D., NASHVILLE, TENNESSEE
(Resident in Obstetrics and Gynecology, Vanderbilt University Hospital)

THIS case is reported because of the autopsy findings and the unusual cause of death. The perforation of the wall of the uterus with pointed instruments is not an uncommon occurrence but to combine with this unfortunate accident a complete severance of the lower bowel, makes this case worthy of mention. The fact that the patient died shortly after being given a magnesium-glycerin and water enema called for laboratory investigation.

CASE REPORT

The patient, a multipara, aged thirty years, was admitted to Vanderbilt Hospital from a distant rural community. Her condition had grown steadily worse since having a spontaneous miscarriage of a five months' fetus ten hours previous to admission. The attending physician who accompanied the patient to the hospital stated that the placenta could not be expressed. He, assisted by another physician, attempted a manual removal; this failing, a pointed steel forceps was used. Before using the forceps, a cord-like structure of bluish color was seen protruding from the uterus. One physician thought it was the umbilical cord; the other thought it was intestine. It was not looped and from its ragged end exuded a brownish substance. It was removed, according to the physician.

On admission (11 P.M., Jan. 6, 1928) the patient gave the appearance of a well-nourished white woman, acutely ill, anemic, and suffering extreme pain. She had temperature of 101.6° F., pulse 115, respiration 36, B. P. 125/90. The abdomen was slightly distended and tympanitic. The slightest palpation over lower quadrants elicited complaint of pain. Patient kept her knees flexed because it was more comfortable. Uterus could not be palpated above symphysis, due to tenderness. Vaginal bleeding was moderate, and there was some edema of lower extremities. The physical examination was otherwise essentially negative. Admission laboratory report was: urine negative, R. B. C. 3,250,000; W. B. C. 15,000; hemoglobin 60 per cent, clotting time four minutes. Patient was put in Fowler's position and given morphia, 0.065 gm., pituitrin 1 c.c. and fluid extract ergot 2 c.c. every six hours.

In the forenoon of Jan. 7, patient was seen by several members of the staff. She was lying in bed quietly. The anemia was more pronounced, and abdomen markedly distended with tympany anteriorly and dullness in both flanks suggesting fluid. Abdominal tenderness was extreme. A blood culture was taken and blood typed for transfusion. Laboratory reports were: R. B. C. 3,050,000, W. B. C. 19,000, hemoglobin 55 per cent, while temperature was 102° F.; pulse 120 and respiration 44.

*Read before the Vanderbilt University Medical Society, Nashville, Tenn., April 5, 1928.

Through a bivalve speculum the placenta was seen in the cervix and easily removed without excessive bleeding. Careful examination of placenta revealed that the umbilical cord had been cut away close up to amnion and membranes torn off.

While preparations for a transfusion were being hurried, the patient was given a magnesium-glycerine and water enema to relieve the marked distention of the abdomen. Only a small amount of the fluid returned. The patient stated that she was sure she would feel much better as soon as the "gas" was passed. In less than ten minutes patient began screaming with pain in abdomen. This agony

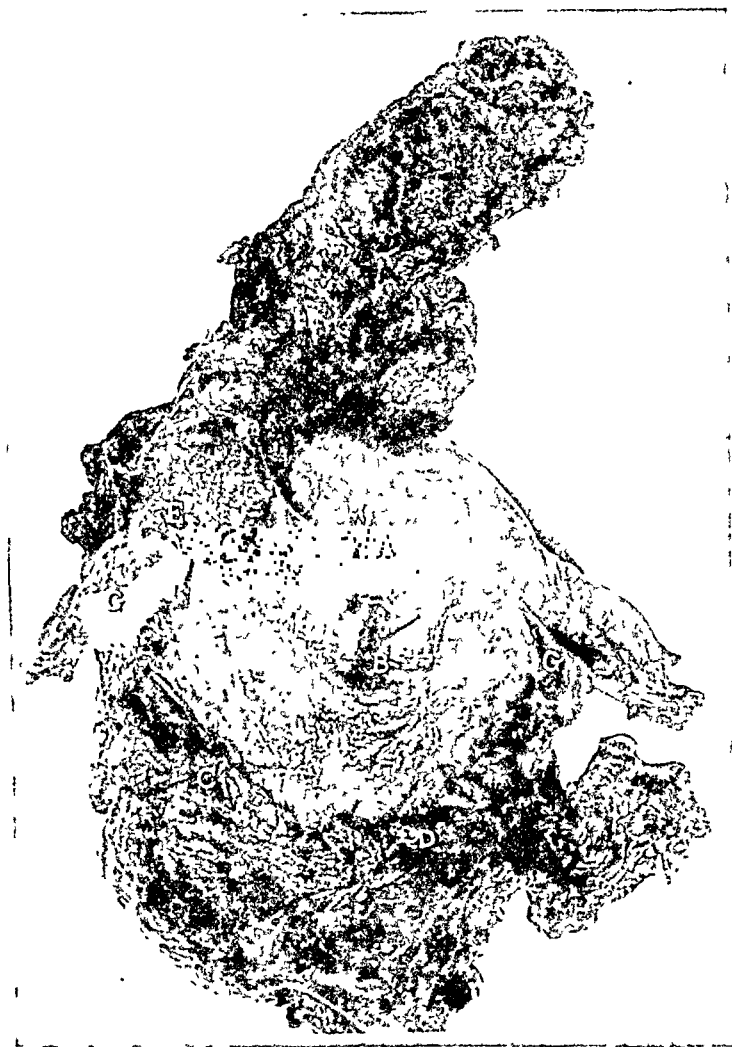


Fig. 1.—Photograph of pelvic organs. A and B, Perforations in posterior wall of uterus, C and D, Upper end of remaining portion of rectum laid open. E and F, Torn lower end of sigmoid. G, Ovaries and tubes.

ceased in about five minutes and patient seemed to be comfortable, only to pass gradually into unconsciousness. Respiration was rapid for a few minutes and then became slower. At this moment blood pressure was 120/50 and pulse regular and of good volume. Foot of bed was elevated. In a very few minutes patient died of paralysis of the respiration, for the heart continued to beat with regularity and good volume for several minutes after respirations ceased. Death came within thirty minutes after enema was given.

Clinical diagnosis was: (1) puerperal sepsis; (2) peritonitis, acute, generalized; (3) perforation of uterus.

AUTOPSY REPORT

Upon opening the abdomen about 800 c.c. of a thin bloody fluid was found filling the peritoneal cavity. The viscera of the lower abdomen and pelvis were covered with fibrinous exudate of recent formation. The uterus was enlarged, soft, and of a deep reddish color. The anterior and lateral surfaces of uterus were smooth, but on the posterior surface were two openings situated in the midline of the organ. The upper one (Fig. 1-A.) was rounded and punched out, while the lower (Fig. 1-B.) was a transverse tear measuring 2 cm. across. These perforations were supposedly made by an instrument introduced into the uterus through the cervical canal. Beneath the uterus, as the organs lay in situ, it was found that the continuity of the sigmoid and rectum was broken by the complete severance of the rectum and apparently the removal of a portion of it.



Fig. 2.—Uterus with anterior wall opened to show perforations in posterior wall.

The Pathologic Department made the following anatomic diagnoses:

1. Perforation of uterus, traumatic.
2. Tears of rectum, acute, traumatic.
3. Colitis and proctitis, acute, traumatic.
4. Peritonitis, acute, generalized.
5. Hemorrhages, subserous, multiple.
6. Endometritis, acute.
7. Pleuritis, healed.

COMMENT

It so happened that the chief of the staff was making ward rounds with the house staff at the moment when the patient made her unusual exodus and all were present to witness it. The question arose as to the immediate cause of death. No apparent reason could be advanced for respiratory paralysis, since the usual circulatory signs of shock were absent. Apparently the enema had some connection with the sudden change of the patient's condition. With knowledge of the autopsy findings it was evident that its contents had flowed into the peritoneal

cavity through the severed rectum. The enema contained magnesium sulphate, 30 c.c. (50 per cent solution), glycerin, 60 c.c., and water, 90 c.c. I conceived the idea that possibly the rapid absorption of the magnesium sulphate by the peritoneum had produced such a marked central nervous system depression that the respiratory center had been paralyzed.

Cushney¹ states that magnesium sulphate solution when given intravenously produces anesthesia resembling that of chloroform, except it results fatally with paralysis of the respiratory system. It has very little effect on the heart. He states further that when taken by mouth magnesium sulphate is so slowly absorbed from intestines that the kidneys excrete it rapidly enough to prevent its accumulation in sufficient amounts to cause any respiratory depression. Sollmann² similarly states that magnesium sulphate is a respiratory depressant, but that its action is antagonized by that of a calcium chloride solution when given intravenously. Jung and Cook³ found that they could give a rat 5 c.c. of a 1 per cent magnesium sulphate solution intraperitoneally hourly for five hours with safety, producing the usual anesthetic reaction. If, instead of the divided doses one gave 25 c.c. of the same strength in one intraperitoneal injection, the anesthesia was followed by death. The work of Lazard⁴ and his coworkers has proved the safety of intravenous magnesium sulphate treatment in eclampsia when 10 per cent solution is given in 20 c.c. amounts. Similarly, according to Dorsett⁵ patients with eclampsia have tolerated repeated intramuscular injections of small amounts of 50 per cent magnesium sulphate solution.

EXPERIMENTAL EVIDENCE

To substantiate the contention that magnesium sulphate is absorbed from the peritoneal cavity and acts as a respiratory depressant, it was decided that the contents of the magnesium-glycerin-water enema in the same proportion as used in patient be injected intraperitoneally in dogs. A dog (10 kilos) was anesthetized with ether and a kymograph rigged up to register the jugular venous pressure and the respirations. When the drum was recording everything smoothly, a mixture of magnesium sulphate, 30 c.c., glycerin, 60 c.c., and water, 90 c.c. (the same proportion and quantity of the enema given the patient) was slowly injected into the peritoneal cavity. In about five minutes the graph showed that the respirations were very rapid. This lasted only about five minutes, when they became slow and deep. The venous pressure was unchanged. Respirations ceased fifteen minutes after injection while heartbeats and venous pressure registered for a few moments. The experiment was repeated with another dog. This time only half of the above mixture was injected in 20 c.c. amounts with a few minutes between each. The animal showed the same periods of respiratory

excitement followed by depression and cessation of respirations thirty-five minutes after first injection. Venous pressure kept up for about thirty seconds and then the heart stopped suddenly. The abdomen was opened and more fluid found than was injected, suggesting that the mixture had a hygroscopic action on the peritoneum.

Next a dog was tied in a trough on his back without anesthesia. His normal respiratory rate and heartbeats per minute were noted. Half of the original mixture (90 c.c.) was injected into the peritoneal cavity. Before injection was completed the dog became restless and seemed to be having convulsive contractions of muscles of abdomen and chest. In ten minutes the dog was quiet and apparently going into a stage of anesthesia in which respiration became very rapid while heartbeats remained fairly constant. Deepest anesthesia was reached thirty minutes after injection, only the corneal reflex remaining active. Forty minutes after injection signs of returning activity were in evidence, until at ninety minutes, animal was barking and apparently conscious again. It was evident that the dog had tolerated the half dose; so the other half was given intraperitoneally. Again dog struggled for a few moments, only to pass into slow labored breathing which ceased in seven minutes after this second injection. The heartbeats stopped two minutes afterward. Peritoneal cavity was found to contain 370 c.c. of a clear fluid in excess of amount injected.

On the next animal the glycerin was eliminated from the mixture, that is, magnesium sulphate, 30 c.c. of a 50 per cent solution with 90 c.c. of water, or 120 c.c. of a 12.5 per cent solution was injected into the peritoneal cavity. No anesthesia was given. Dog was quiet throughout injection and made no noise until period of respiratory excitement came on in ten minutes. Respirations gradually slowed as anesthesia deepened, until they ceased at thirty minutes after injection. Heart continued with full beats for three and a half minutes afterward. Abdominal cavity had only 125 c.c. of fluid in excess of amount injected.

It was next decided to attempt to counteract the action of magnesium sulphate in the blood stream by intravenous injection of calcium chloride solution, since it is known to have an antagonistic action to that of magnesium sulphate. A dog was injected intraperitoneally with the same mixture (without glycerin) as used in last experiment. After three minutes of excitement respirations stopped and heart continued to beat for seven minutes. The cause of the sudden death was found when abdomen was opened. The needle had entered the liver substance, allowing some of the magnesium sulphate solution to go directly into the circulation. Another dog was more carefully injected with the same solution. It presented the same signs of all previous animals except the respirations ceased sooner than was ex-

pected (eighteen minutes after injection). Femoral vein was cut down and 10 c.c. of 2.5 per cent calcium chloride solution injected, but circulation had stopped. About 5 c.c. of the calcium chloride solution was injected directly into the heart, and it was surprising to see the circulation reestablish itself. The animal took several deep breaths (three minutes after ceasing first time) before circulation stopped. Peritoneal cavity contained only 65 c.c. in excess of injected fluid.

The above results were checked by repeating the experiment on another dog. As respirations were slowing down, 10 c.c. of 2.5 per cent calcium chloride solution was given into the femoral vein, but the heart action was sluggish; so 5 c.c. was also injected directly into the heart. Circulation was immediately reestablished and the dog breathed deep and regularly for one and a half minutes. It is probable that the large amount of magnesium sulphate already in blood stream overbalanced the action of the calcium chloride solution.

SUMMARY AND CONCLUSIONS

1. The case shows clearly the dangers of intrauterine instrumentation in attempting to remove a placenta that cannot be readily expressed.

2. The autopsy findings of traumatic perforation of wall of the uterus associated with severance of the lower bowel and removal of a part of the rectum presents a gruesome warning to all.

3. The unusual death in this case stimulated investigation into the pharmacologic action of the ingredients of a magnesium-glycerin and water enema.

4. The glycerin-magnesium sulphate combination when given intraperitoneally has a hygroscopic action on the peritoneum, in that it draws fluid into the peritoneal cavity. This action is less evident with dogs in which magnesium sulphate solution alone was used.

5. Each animal in the series died of paralysis of respiration rather than cardiac failure due to the respiratory depressive action of magnesium sulphate.

6. Calcium chloride solution given intravenously will counteract this depressive action of magnesium sulphate on the respiration.

7. The animal experimentation, while by no means complete in details, gives the laboratory evidence which was sought to support the contention that magnesium sulphate was absorbed by the peritoneum rapidly enough to produce such respiratory depression as to have caused the death of the patient.

I wish to thank Dr. Lucius E. Burch, Head of the Department of Obstetrics and Gynecology for his encouragement and keen interest in my working out this problem. Also, I thank Miss Susan H. Wilkes for the photographs and drawings of specimens.

REFERENCES

- (1) *Cushny*: Textbook of Pharmacology, Philadelphia, Lea and Febiger. (2) *Sollmann*: Manual of Pharmacology, Philadelphia, W. B. Saunders Co. (3) *Jung and Cook*: Proc. Soc. Exper. Biol. and Med., 1927, xiv, 586. (4) *Lazard, Irwin, and Vruwink*: AM. JOUR. OBST. AND GYNEC., 1926, xii, 104. (5) *Dorsett*: AM. JOUR. OBST. AND GYNEC., 1926, xi, 227.

626 MEDICAL ARTS BUILDING.

ENDOMETRIOSIS OF AN ABDOMINAL SCAR FOLLOWING CESAREAN SECTION*

BY PERCY H. WILLIAMS, M.D., NEW YORK, N. Y.

THE case I wish to report is one of endometriosis of an abdominal scar following a second classical cesarean operation.

The patient, a woman of thirty-five, was admitted to Lenox Hill Hospital with a diagnosis of movable retroversion and an inflamed painful scar following two cesarean sections which were done respectively nine and seven years before. She admitted that the scar was somewhat changeable in color, but she had not noticed that the variation had any relation to the menstrual cycle.

Physical examination was otherwise negative except for a third degree movable retroversion which was giving her no symptoms.

The cicatrix measured 8 cm. in length and involved the umbilicus at about the junction of the upper and middle thirds. It was firm, thickened, irregular, and rather heaped up in appearance. Its surface was moist and rather sticky to the touch, she said it was constantly "perspiring." It was dull pink and had the appearance of chronically inflamed cicatricial tissue.

No hernial ring could be made out because of the brawny tissues, but a slight impulse on coughing made one suspicious of an underlying hernia.

A diagnosis of a chronically inflamed cicatrix overlying a hernia was made but a possible sarcoma could not be ruled out. Endometriosis was thought of but dismissed, because there was no history of variation of color with the phases of the menstrual cycle.

Operation took place the day after admission. The scar was excised by a narrow elliptical incision; the hernia repaired by muscular overlapping, and the excised portion sent for microscopic examination.

Convalescence was uneventful; patient left the hospital in seventeen days.

Microscopic examination of the various parts of the specimen showed diffuse involvement of the cicatrix by adenomyoma with all the characteristics of typical endometrial tissue. The tumor was poorly outlined and extended from beneath the epidermis to the peritoneal surface and laterally to the margins of the scar. The peritoneum was not involved.

The bulk of the tumor was composed of smooth muscle cells disposed in bundles running in all directions. Imbedded in this tissue were small islands of fat and epithelial tubules or cysts, either single or in groups, sometimes resting directly on the muscle but more often separated from it by zones of cellular tissue resembling the endometrial stroma. The tubules were lined with a single layer of nonciliated cuboidal or cylindrical epithelial cells. Morphologically they were identical with uterine glands. In a few tubules the epithelium was degenerated and the lumina

*Read at a meeting of the New York Obstetrical Society, May 8, 1928.

filled with granular débris. The tissue surrounding the tubules was edematous and usually infiltrated with inflammatory cells.

Whatever opinion one may hold as to the origin of the endometrial implants so ably described by Sampson,⁵ when found in other sites, this case seems undoubtedly one of transplantation to an open scar by the dragging over it of the contents of the gravid uterus during cesarean section.

Heaney,² in 1925, in describing a similar case found in the literature, reports 29 instances of endometriosis in abdominal scars. Schwartz,⁶ of St. Louis, added 2 more cases, and this case is the thirty-second.

In analyzing these 32 cases, 14, or nearly 44 per cent, followed ventral fixation. It is difficult to understand why this condition should occur so frequently after fixation when we take into consideration the comparative rarity of this operation compared to the frequency of the classical cesarean section. Is it that the sutures are often passed entirely through the muscle wall into the uterine cavity and out again through the abdominal wall, carrying grafts of endometrium with them? If so, it should warn us to pass our sutures less deeply. However, in some of these cases as the two reported by Sampson, excision or resection of the tubes was performed. Two cases, or 6.2 per cent, followed hysterectomy; whether subtotal or complete I was unable to determine, but presumably supravaginal. Three cases, or 9.3 per cent, followed unspecified pelvic operations.

Two cases, 6.2 per cent, followed appendectomy and one oophorectomy. Ten cases, or 31.2 per cent, followed either cesarean section or some operation involving the opening of the cavity of a pregnant uterus, that is, rupture of the uterus during attempted abortion, 2; hysterotomy during an operation on a pregnant uterus, 1, and cesarean section on the full-term uterus in 7.

Dr. Sampson, in kindly writing to us about this case says among other things: "I have never encountered such a case in my own practice following cesarean section. On the other hand, I have had two cases of endometriosis in the rectus muscle following fixation of the uterus to the abdominal wall. There have been cases reported of endometriosis of the abdominal scar following operation in which the uterus has not been opened and for this reason some believe that the endometriosis in these cases results from the transplantation of bits of peritoneal serosa included in the wound rather than the transplanting of uterine mucosa by the surgeon."

Nicholson³ in England and Novak⁴ in this country hold this view.

If it is difficult to understand how the müllerian mucosa can be transplanted in cases not involving the opening of the uterus or section of the tubes, it is equally difficult to understand why, if these growths result from the implantation of bits of peritoneal serosa, they have never been found except in females.

REFERENCES

- (1) *Danforth, W. C.*: AM. J. OBST. & GYNEC. 10: 630-32, 730, 1925. (2) *Heaney, N. S.*: AM. J. OBST. & GYNEC. 10: 625-30, 730, 1925. (3) *Nicholson, G. W.*: J. Obst. & Gynaec. Brit. Emp. 33: 620-33, 1926. (4) *Novak, E.*: AM. J. OBST. & GYNEC. 10: 802, 1925. (5) *Sampson, John A.*: AM. J. OBST. & GYNEC. 10: 649-64, 1925. (6) *Schwartz, O. H., and Paddock, R.*: AM. J. OBST. & GYNEC. 10: 153-71, 1925.

429 PARK AVENUE.

(For discussion, see page 120.)

RECIPROCAL RELATIONS BETWEEN DISEASES OF THE ALIMENTARY AND FEMALE GENITAL SYSTEMS

BY A. J. WALSCHEID, M.D., NEW YORK, N. Y.

THE digestive system can be influenced by the female genitals and their diseases in a reflex manner through the sympathetic and parasympathetic nervous systems. This causal relationship is in evidence especially at the critical periods of puberty and the menopause, and in connection with the functions of menstruation, gestation, parturition, lactation, etc. A strong predisposition is supplied by the state of the female organs at the time, and especially at the time of the menopause, when the uterus and ovaries are undergoing regressive changes. The organs are no longer able to produce their peculiar hormones, and this deficiency disturbs the entire equilibrium of the hormonal system, which in turn is felt in the disturbed innervation of the autonomic system, manifested respectively as vagotonia or sympathetico-tonia.

Without any immediate attempt to fix the primary responsibility attention may be called to the transitory spastic states which are apt to supervene at the menopausal period in the alimentary canal from the esophagus to the colon. This spasticity may be multiple and affect different levels of the canal, and the symptom picture may not only be very complicated and varied but the frequent spastic contractions may contribute to the development of peptic ulcer. Spasticity may of course be sufficient per se to cause ileus or incomplete stasis and may also be a factor in stasis of mechanical origin. As a result, while intestinal obstruction is rare from this cause, we may readily surmise the development of general stasis and autointoxication.

The woman at the menopause may suffer from suppurative foci in the teeth or elsewhere in the digestive tract and the physiologic state at that epoch may possibly light up focal infection; however, the teeth should be put in order even if there is no actual evidence of focal infection.

In speaking of the disequilibrium of the hormonal system induced at the menopause, the question of high blood pressure comes up. If this were a common phenomenon, a relationship would be suspected; but in my own experience high blood pressure at the menopause is due to some special cause not related to the latter. Hence, if I find

the blood pressure too high, I set about to find the leading causal factor, and if such cannot be found, we evidently have nothing more than a case of so-called essential high blood pressure in which no causal factor of any kind can be isolated.

To those who cannot visualize that dysfunction of the menopause is able to affect the digestive system through the vagus, it is well to note that paroxysms of bronchial asthma may result in this manner.

Leaving the subject of the menopause and reflex irritation, attention must be directed to the possibility of mechanical compression of the lower bowel, especially in the case of a uterus enlarged, for example, by fibroids, or of adhesions between the left adnexa and pelvis, which are known to cause partial occlusion of the sigmoid. In compression by a fibroid uterus an additional factor may develop in an adhesive peritonitis. Even a simple retroflexed uterus bound down by adhesions may give rise to much rectal disturbance. At the present time a routine proctoscopic examination of all gynecologic patients ought to be urged.

I have already mentioned pelvic adhesions under adnexal disease and the subject comes up again under parametritis. There are two end-results: viz., an unabsorbed fibrinous exudate and the contracting form which is due to absorption and fibrinous contraction in the broad ligament. Either the paravesical, parauterine, or pararectal tissue may contract or the process may involve all jointly in a stellate formation. If an exudate forms at the lateral margin of the uterus, whether of the lymphatic or thrombophlebitic type, it may encroach on the sigmoid and displace the lower end of the bowel laterally; and if contracture occurs, there may result a partial or complete occlusion, either in the sigmoid or rectum. After absorption has occurred, the constriction may be released for the time being, although permanent narrowing may be the end-result. Bacterial penetration from the bowel may cause suppuration of the exudate or pelvic abscess which may burst into the sigmoid or rectum, leaving fistulas.

Primary parametritis may result from simple infection, trauma, or puerperal infection, the first two from the use of instruments, and especially from the traumatic effect of the curette. Enterogenous cases have already been mentioned, and the intestinal obstruction which may develop in this type may call for a colostomy. On the right side the pathology naturally differs much from that on the left, as in place of sigmoid and rectum there are the cecum and appendix as well as the terminal ileum to be considered. In cases of salpingitis and perisalpingitis as well as in cases of cystic ovary all of these structures may be involved jointly in adhesions, with obstruction and toxæmia. In such cases, originating in the ovary, the only symptom perhaps is pain, chiefly in the intestine from obstructive colic. Naturally any of the pathology mentioned above may occur after operations.

Insufficient attention is paid to the ileum, cecum, and sigmoid in surgery below the umbilical line. General neglect of the peritoneal toilet and careless pulling out of the walling-off pads are to blame for some of these complications which involve the genitals with the alimentary canal. In my experience a careless appendectomy may light up an ovarian cyst with unusual complications in women who have never presented any evidence of genital pathology.

On the left side we have the condition known as perisigmoiditis, which, while much less frequent than appendicitis, gives rise to a similar clinical picture and in the female may be complicated by adnexal disease. Perisigmoiditis as is well known accompanies diverticulitis, and the chronic form of the latter closely simulates cancer of the sigmoid. Diverticulitis, in setting up perisigmoiditis, naturally causes adhesive complications. The peculiar shape of the sigmoid and its proneness to lengthening and dilatation give large opportunities for adhesion formation and incidentally for kinking, partial obstruction, further dilatation, and more adhesion. It must be borne in mind that inflammation is not absolutely necessary for adhesion formation which may result simply from the friction of newly apposed segments of bowel. In addition to adnexal disease adhesions may form in connection with a parametritic exudate. Another property of the sigmoid when not fixed by adhesions and when abnormally long and mobile is the ability to migrate to almost any abdominopelvic location and form adhesions of the most bizarre character. Naturally adhesion formation arrests the tendency to wander farther. I have found it adherent in the right iliac fossa. In some cases, of course, the sigmoid is pushed out of place by large tumors.

Attention should be called to the close relationship often found between appendicitis and menorrhagia, so that when the latter is present without apparent cause, we should investigate the possibility of latent appendicitis. Appendectomy has sometimes been followed by the disappearance of menorrhagia and even of dysmenorrhea. In such cases the pathology involved probably has to do with passive congestion of the pampiniform plexus or some adnexal complication in which adhesions have interfered with the circulation.

I have already expressed the belief that a proctosigmoidoscopic examination should always be made by the gynecologist as a routine measure. Should sigmoiditis be found, it will very probably involve the pelvic viscera secondarily. Conversely, in adnexal disease the escape of saprophytes or septic germs through the fimbriated extremity may set up pelvic peritonitis, with adhesion formation between the posterior wall of the uterus and anterior wall of the rectum. In such a case we may encounter rectal tenesmus, mucoid discharge from the rectum, pain, and on examination, much tenderness. These acute symptoms may later be replaced by the effects of contraction of the

adhesions which cause retrocession or retroflexion of the uterus, the displaced fundus uteri being forced against the rectum.

The general syndrome of utero-enteric pathology comprises back-ache, menorrhagia, marked constipation, meteorism, etc., and this primary symptom group may be followed by a great variety of secondary pathology comprised under intestinal toxicosis, neurasthenia, and many forms of organic disease of the alimentary canal.

I have alluded only casually to the secondary effects of large tumor masses and cysts originating in the female genitals upon the functions and structure of the alimentary canal. It must be pointed out, however, that unless the pressure is exerted within the true pelvis (upon the sigmoid and rectum), the digestive tract is not much menaced. This we can understand in connection with the pregnant uterus, which does comparatively little damage to the parts of the alimentary canal above this level and even does not greatly disturb the functions of the latter during gestation. In the same manner an enormous simple myoma or ovarian cyst may exist without causing the slightest disturbance of the digestive tract.

Owing to the thinness of the rectovaginal septum, cancer of the cervix, which implicates the latter, soon leads to fistula formation, and the natural extension along the parametria may also extend to the rectum. Cancer of the vagina rapidly extends to the rectum with fistula formation. The converse, however, is not true, for cancer which is primary in the rectum involves the genitals only very late in the disease. Ovarian cancer, which is usually metastatic, involves the intestine in adhesions. Not often encountered by the operating surgeon but familiar to the pathologist is the mass of adhesions and distortions seen in the last stages of intestinoperitoneal tuberculosis and secondary carcinosis of the peritoneum. These may involve alike the intestinal and generative organs, especially the former, causing multiple strictures of the small bowel. Owing to the moribund condition of the patients, such conditions naturally do not present much clinical interest.

When considering the reciprocal relations between the reproductive and alimentary systems, it should always be borne in mind that either one may be involved primarily, the other participating as a secondary manifestation. It is equally true, however, that the involvement of both systems may be a pure coincidence, although with the intimate relationship an affection of one system may make itself felt on the other. Naturally certain predisposing factors may encourage the development of disease of both systems at the same time, including anemia, general ptosis, and the habitus asthenicus. The physical type and race may also constitute a factor. Thus in the asthenic, more or less infantile type, we may see certain gastric disorders before puberty and when the latter develops there may be an association of symptoms involving both systems—on the part of the reproductive

system, menstrual anomalies; on the part of the digestive system, anorexia, nausea, and vomiting. An objective examination may show in the reproductive system stenosis of the cervix, hypoplastic ovaries, and other evidences of infantilism, while the use of the sigmoidoscope may reveal the presence of colitis. In addition the nervous system, including the autonomous portion, and the endocrine system may participate and cause all sorts of nervous and systemic manifestations, such as migraine and hysteroid symptoms. Finally it may be shown, in general, that menorrhagia diminishes gastric secretion even to anachlorhydria, while the opposite state may cause hyperchlorhydria; although if menstruation is within normal limits, no effects are produced in the alimentary system. Vicarious menstruation may be expressed as hematemesis, bleeding from the lips, etc., which have been known to persist beyond the menopause.

At the menopause there is a marked tendency for the development of nervous symptoms referred to the stomach and associated with the vagus tract. Painful and paresthetic sensations may be felt as high as the tongue, and marked hyperacidity is present as a rule. These sensations may simulate those due to gastric ulcer and, according to some authors, the latter is actually present in one group of cases. It is hardly necessary to point out the gastric symptoms of gestation, since these are so well known. There are several motivations—reflex, autotoxic, psychogenic—so that it is difficult to isolate the component which corresponds to the gastric disturbances of puberty and the menopause; nor can we explain why the primipara is so much more apt to suffer from gastric symptoms than the multipara. The fact that occasionally a pathologic nongravid uterus can mimic the nervous symptoms of pregnancy has always been accepted as evidence that a reflex factor is involved, although the mere presence of the ovum in the uterus can hardly be the eliciting factor, since the reflex symptoms are present in the same degree in ectopic gestation. The rôle of the puerperium and of lactation in causing disturbance in the functions of the alimentary canal is causal and indirect.

Gynecologic ailments were said by some of the older clinicians to cause "uterine dyspepsia," but at the present time this relationship is regarded as problematical, and the nervous manifestations may be traced to other sources. Formerly there was not the tendency or the knowledge available to exclude various factors, such as endocrine on the one hand or an erroneous sexual life on the other (coitus interruptus). Moreover, there may have been organic disease of the stomach in some of these cases.

Let us take at random an example of genital disease as a cause of gastroenteric disease. A woman has genital prolapse and subinvolution of the uterus, with retrodisplacement and fixation in this position by adhesions. When she lies down at night, she may suffer sooner or later from severe backache, abdominal pain, and vomiting. If she

sits up in bed or gets up, the disagreeable symptoms gradually wear away. The latter, by the way, frequently rouse the patient from her sleep. The motivation in this kind of case is reflex peritoneal irritation from the fixed adherent uterus. Uterine prolapse may also disturb the gastroenteric tract in a reflex manner.

Conversely let us take an example of gastroenteric pathology causing genital disease. Here it is usually some portion of the lower half of the alimentary tube which is at fault. Of functional anomalies obstipation may be cited, for efforts at defecation tend to cause or increase prolapse of the uterus, and under organic lesions appendicitis and its adhesions may be responsible for right adnexal pathology.

In certain cases as already mentioned both systems may be affected synchronously from the same causal factors. Here belongs especially visceroptosis which may affect the viscera of both systems. A psychogenic substratum may also make itself felt and so in general may any general cause of diseased conditions whether anemia, infection, or toxemia.

In general diagnosis, therefore, we have to isolate all possible general causes of disease to determine the rôle played in causing pathology of either system; and at the same time we must show how one system can cause or aggravate the disease in the other through its own abnormalities.

139 WEST SEVENTY-EIGHTH STREET.

CASE OF INTESTINAL OBSTRUCTION SIMULATING TWISTED OVARIAN CYST

BY ABRAHAM J. FLEISCHER, M.D., NEW YORK

THIS case is presented in the hope that a clinical experience, which fortunately had a happy culmination, might prove profitable to others encountering the same condition.

Mrs. B. C., thirty-two years of age. Previous history: She was frequently constipated, requiring the use of laxatives; she complained of frequency of urination. Menstruation began at the age of twelve, twenty-four days type, flow lasting three to four days, moderate in amount. Her last regular period began on September 16, 1927. Dysmenorrhea, menorrhagia, or metrorrhagia were never experienced. First pregnancy, delivery and puerperium were uneventful. One induced abortion in 1919, shortly following the birth of her baby. Recovery was uneventful. Her gynecologic history revealed a state of sterility since the time of her abortion. There were no previous illnesses or operations. The family history revealed the death of one brother due to intestinal obstruction.

On October 3, 1927, I was called to see this patient, at three o'clock in the afternoon. When I arrived, I was compelled to wait some ten minutes before I could see the patient, who had gone to the lavatory. I mention this fact, because of the striking disproportion between the clinical picture and the operative findings. She gave a history of having had an acute attack of pain in the left lower quadrant of the abdomen at 9 o'clock that morning. This was followed by

fainting. There was no nausea or vomiting. She had just had a normal bowel movement, which she said was not blood-stained.

Physical examination revealed an adult female, apparently not acutely ill. Rectal temperature 99°, pulse 80, blood pressure, 120/80. Examination of the head, neck, and chest showed no abnormal findings. The abdominal wall was markedly obese and decidedly tender over the left lower quadrant. Corresponding to this area of tenderness, a large mass, about six inches in diameter, was definitely outlined. It was movable, and imparted a cystic feel. Vaginal examination did not establish any connection of this mass to the uterus, which was small, firm, and freely movable. No adnexal pathology could be elicited, other than that of the abdominal findings.

With the history of acute onset of pain, accompanied by fainting and the physical findings, a diagnosis of twisted ovarian cyst was made, and the patient prevailed upon to go to the hospital for immediate operation.

At 6:30 P.M. of the same day, laparotomy was performed under ether anesthesia. On first examination of the abdomen and pelvis, through a midline incision, no apparent pathology could be detected. The uterus and ovaries were brought into the field of operation, and were found to be normal. Upon further inspection, through the aid of bimanual palpation, one hand within the abdominal cavity, and the other over the abdominal wall, the mass was found to be attached to the anterior abdominal wall by a thick band of connective tissue. By means of finger dissection, this mass was separated and brought into the line of incision. The dissection was not difficult, excepting at the point of attachment of the tumor mass to the abdominal wall, where this firm band was encountered. The mass consisted of about eight inches of black intestine, involving the lower portion of the ileum, about which, lying in juxtaposition, was healthy jejunum and ileum. The apparently gangrenous intestine was devoid of visceral peritoneum at a point, midway, corresponding to the area of attachment of the band. The intestinal wall presented numerous hemorrhagic areas, varying from $\frac{1}{4}$ to $\frac{1}{2}$ cm. in diameter. The distal mesenteric vessels, at the line of attachment of mesentery to ileum, were thrombosed at four different points. These thrombi ranged from $\frac{1}{2}$ to 1 cm. in diameter. With the aid of hot packs, the tone and luster of the injured gut returned, and so, fortunately, resection was not necessary. The intestine was repositioned, and the abdomen closed without drainage, after the appendix had been removed. During the first four days she had a temperature of 100.8°, after which her convalescence was uneventful. She was discharged after a two weeks' stay in the hospital with a postoperative diagnosis of an acute partial intestinal obstruction, due to an adhesive band, with secondary thrombosis of the smaller distal mesenteric vessels.

Five months after operation, the patient is well, and about her usual vocation, complaining only of occasional constipation.

One's curiosity, in a case of this kind, is naturally aroused by the peculiar pathology, and the more obscure etiology. The clinical findings of an abdominal mass are readily explained. A piling-up of healthy intestine about a diseased portion of bowel is only nature's expression of an attempt at a protective mechanism. Such a mass can very easily impart to the examining fingers the impression of an ovarian cyst. And when the obesity of the abdominal wall is so marked that a mass cannot be definitely determined one must rely on an area of dullness elicited by percussion. In April of 1927 I was called to see a case that presented the very same clinical picture as the one herein described. An unusually obese abdomen allowed of no

definite palpation of a mass, but percussion did reveal a definite area of dullness, upon which finding, together with the history, a diagnosis of twisted ovarian cyst was made and confirmed at operation.

The pathology in this case is not a very unusual one. The kinking of the intestine at the point of attachment to the abdominal wall, of necessity, impaired the circulation, with the resulting debility of the intestinal wall, bordering on absolute gangrene, expressed in the hemorrhagic appearance, discoloration and loss of luster. The thrombosis of the mesenteric vessels, to my mind, was strictly a secondary process to venous stasis, and is more elaborately elucidated by Aschoff's treatise on the causation of thrombosis in the blood vascular system.

What caused this band of adhesion extending from the intestinal wall to the parietal peritoneum? To explain this is not an easy matter. There was absolutely no evidence of an inflammatory or traumatic process in the uterus or its appendages. Can one dare to imagine, that, when this illegal abortion, referred to in her past history, was performed, the uterus was perforated, and the intestine injured at this point; and through the grace of God, the patient made an uneventful recovery, in spite of this abuse? Also, through nature's miraculous powers, healing of this injury was so complete, that it even defied the minutest gross examination of the pelvic organs. Such occurrences have been known in the past. Or shall we look for an explanation to Pfahler's statement: "Localized peritonitis resulting in adhesions is a common condition and while it must often be present without producing any symptoms it is a pathologic condition that should be considered in all obscure abdominal cases." Still another possibility is a primary intestinal phlegmon, akin to that described by Metge. A more abstract explanation would be to resort to Lave's theory: "These bands about the ileum cecum, etc., are embryonal remains . . . persisting folds in the evolution from so-called 'adhesions' in embryo . . . which under normal conditions would disappear."

CONCLUSIONS

A moribund condition of the patient is not an essential requirement in arriving at a diagnosis of intestinal obstruction.

2. It is not an uncommon occurrence for intestinal obstruction to simulate a twisted ovarian cyst, or any other pelvic condition.

3. The pathology resulting from intestinal obstruction may be entirely out of proportion to the clinical picture, in the early stages.

REFERENCES

- (1) *Bainbridge, W. S.*: Boston Med. and Surg. Jour., Feb. 19, 1914. (2) *Draper*: Jour. Am. Med. Assn., Nov. 24, 1917, No. 24. (3) *Hamaker, W. D.*: Jour. Am. Med. Assn., Jan. 17, 1914. (4) *Haynes, S.*: N. Y. Med. Jour., Jan. 10, 1917. (5) *Keilty, R. A., and Smith, Allan J.*: N. Y. Med. Jour., March 20, 1915. (6) *Kirchner, Walter C.*: Am. Jour. Obst., N. Y., 1913, lxviii. (7) *Lockwood, C. D.*: International Clinics, iv, Ser. 35. (8) *Metge, E.*: Zentralbl. f. Chir., Oct. 31, 1925. (9) *Pfahler, G. E.*: Jour. Am. Med. Assn., Nov. 16, 1922. (10) *Primrose, A.*: Interstate Med. Jour., 1911, St. Louis. (11) *Willis, A. Murat*: Arch. of Surg., iv, 690.

A FOUR-BLADED SPECULUM

By H. M. NELSON, M.D., DETROIT, MICH.

(*Department of Gynecology and Obstetrics, Henry Ford Hospital*)

WE DEvised this four-bladed speculum in order to get a better exposure of the cervix for local treatment, especially cauterization. The chief difficulties in office cauterization are faulty exposure of the cervix and imperfect protection of the vaginal walls during the treatment. The ordinary bivalve speculum permits the lat-

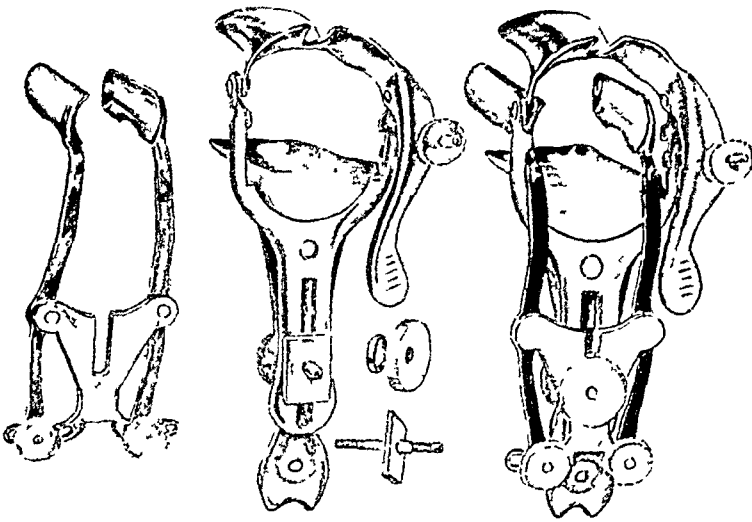


Fig. 1.—Anteroposterior view, showing set screw and adjustability of lateral speculum.

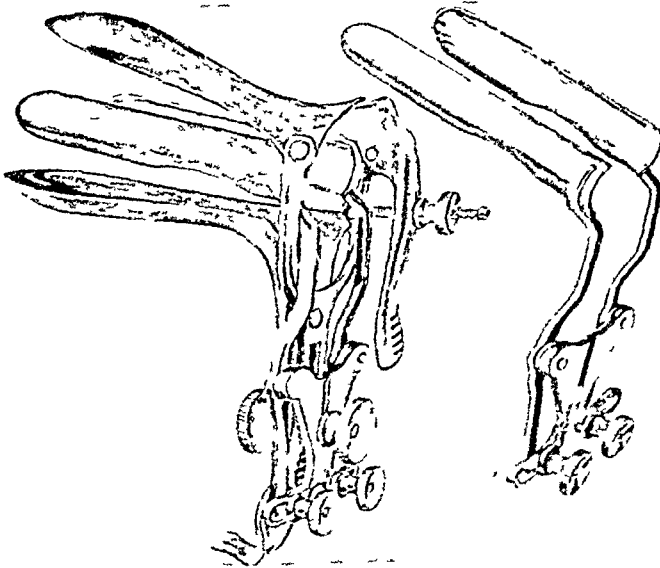


Fig. 2.—Lateral view.

eral vaginal walls to roll in, obscuring the view and causing severe pain from close proximity of the cautery to the vaginal wall. The tubular speculum is not adjustable and is often too small to give proper exposure.

Our instrument consists of an ordinary bivalve speculum with a special set screw attached, so that a lateral bivalve speculum can be inserted. Either blade of the lateral retractor is adjustable and it can be opened even wider than the Graves speculum, thus holding the edges of the vagina apart, giving an excellent view of the cervix.

We have made separate instruments for the medium and large bivalve specula. For general work the medium speculum is the more useful.

The illustrations give both lateral and anterior views.

The latter shows the set screws to which the lateral speculum is attached. It also illustrates the slot and the two set screws on the attachment which permit lateral and anteroposterior adjustments.

We wish to acknowledge the help of Mr. Alfred H. Schmidt, instrument maker for the hospital, who made the speculum and offered very many valuable suggestions.

THE FLUCTUATION OF BLOOD SUGAR BEFORE AND AFTER AN ECLAMPTIC CONVULSION

BY JOHN M. LAFERTY, M.D., J. A. NARK, M.D., AND J. J. SWEENY, M.D.

PHILADELPHIA, PA.

(From the Obstetric Department, St. Mary's Hospital)

DR. PAUL TITUS, of Pittsburgh, has demonstrated that a hypoglycemia, relative or absolute, precedes an eclamptic convulsion. The object of publishing these observations made on one patient is to add to his series. A brief history of this case is as follows:

The emergency patient was a twenty-eight-year-old para v admitted 4/15/28 in eclampsia starting after the end of labor. Her first pregnancy and labor were normal, but were followed by two miscarriages and one premature labor. Previous medical history was poor, for among other diseases she had had diphtheria, scarlet fever, an appendectomy, and mastoiditis. She menstruated at intervals of from sixty to ninety days, the last occurring 8/2/27. Her prenatal course was not supervised and discloses: headache, edema, vertigo, lack of exercise, and a probable gain of 48 pounds in weight. Twenty-four hours before labor there was a period of visual disturbance. Her labor at home was said to be spontaneous, child living. The first convulsion occurred forty-five minutes after the end of her labor and was followed by headache and vomiting but no coma. The second convulsion occurred ten hours after the first; the third after an interval of eight hours and resulted in coma; the fourth occurred shortly after admission and three and a half hours after the preceding convulsion. She had two more convulsions, as listed in

the table. The patient recovered. Treatment: conservative (Rotunda method) plus glucose infusion (Titus).

Physical examination on admission: Coma, followed by convulsions as listed, tongue bitten, myocarditis suspected, pulmonary edema slight, thyroid small, liver not palpable, varicose veins, Babinski sign positive. Urine contained many hyaline and granular casts, marked trace of albumin, a large increase in urobilin and urobilinogen, and an initial output of 500 c.c. Other physiologic data are given in the accompanying table.

TABLE SHOWING VARIATION OF BLOOD SUGAR

DATE	HOUR	STATUS	BLOOD SUGAR	GM. GLUCOSE GIVEN	GLYCO-SURIA	BLOOD CREAT.	BLOOD UREA
4/15	12:30 P.M.	Coma	42	before	—	7.0	20
	3:30 P.M.	"		25			
	3:45 P.M.	Convulsion, 3 m.		25			
	4:15 P.M.	Convulsion					
	4:45 P.M.	Coma	38				
	4:57 P.M.	"	42				
	5:14 P.M.	"	36				
	5:15 P.M.	Convulsion					
	5:16 P.M.	Convulsion ending	42				
	5:22 P.M.	Coma	39	25			
	6:30 P.M.	"		25			
	8:30 P.M.	"		25			
		"		50			
	11:00 P.M.						
4/16	11:30 A.M.	Semicoma	220		+	1.9	18
	5:00 P.M.	"	320				
4/18	2:00 P.M.	Rational	39		—		
4/19	1:00 A.M.	Restless and drop in blood sugar of 4/18		50	—		
	11:00 A.M.	Rational	90	i.e., 10 hr. after reception of 50 gm. glucose			
4/20	11:00 A.M.		110				
4/25	11:00 A.M.		97				

1332 SPRUCE STREET.

REPAIR OF VESICOVAGINAL FISTULA

BY ARTHUR E. HERTZLER, M.D., HALSTEAD, KANSAS

THE following plan of procedure for the repair of vesicovaginal fistula has served me without fail for more than twenty years. The essential feature is that a fold of vaginal mucosa is so prepared that a broad surface is brought in coaptation which is protected from contamination through the bladder by means of staple sutures.

The first steps in the operation do not differ from the more or less classical procedures. The vaginal wall about the fistula is elevated (a, Fig. 1) so that the freshened surfaces may be brought into contact and inverted into the bladder by a row of No. 00 chromic catgut sutures (b, Fig. 1). This row is inverted still further by a second row of similar sutures, either continuous or interrupted (c, Fig. 1; also compare d, Fig. 2).

The mucosa of the vagina is now elevated from the bladder (*d*, Fig. 1). This separation should be made to extend for a centimeter or two, depending on the size of the opening to be closed. These flaps must be mobilized so that they can be brought together without tension.

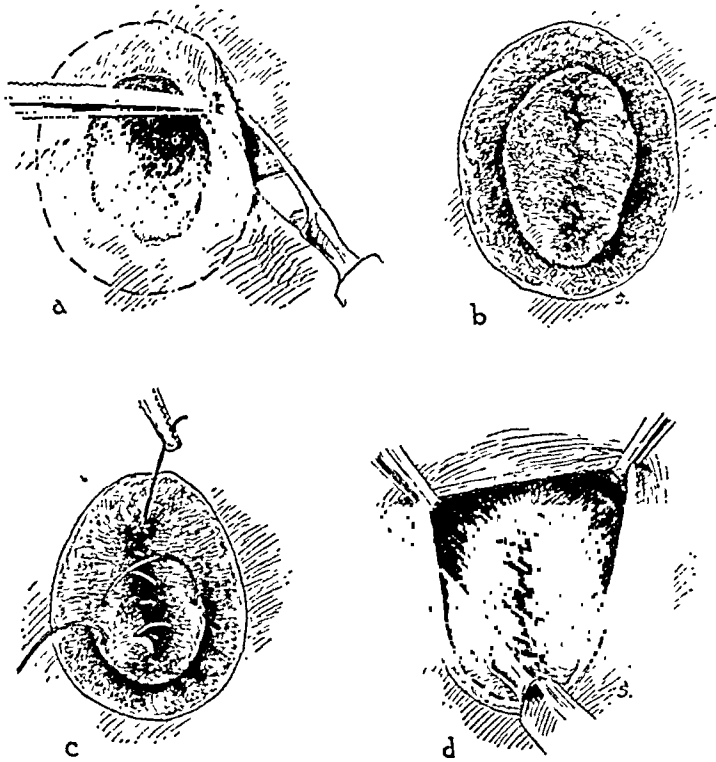


Fig. 1.—Preparation and inversion of the bladder cuff: *a*, Incision about the fistula forming a tube of tissue; *b*, first line of sutures inverting the cuff; *c*, second line of sutures burying the first line; *d*, elevation of the vaginal from the bladder wall.

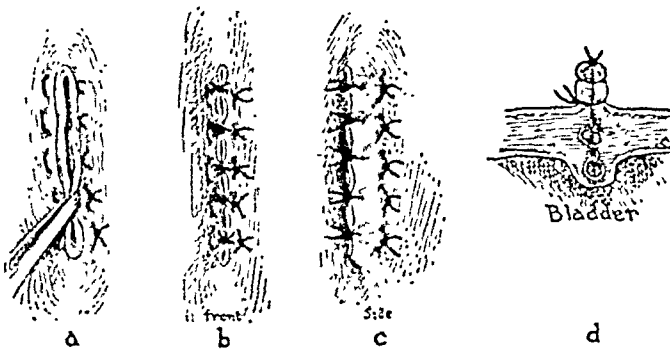


Fig. 2.—Approximation of the vaginal flaps: *a*, Staple sutures are placed at the base of the flaps about 1 cm. or more from the edge; *b*, the edges of the flap are brought together by delicate interrupted sutures; *c*, the operation is finished showing both lines of sutures properly placed; *d*, cross-section of the finished operation showing both lines of inverting sutures, the staple sutures above and the approximating sutures closing the vaginal flaps.

The bases of these flaps are brought together by staple sutures of silkworm-gut (*a*, and *c*, Fig. 2). They must be placed at least a centimeter from the edge and brought snugly together. The line of sutures must not be so tightly drawn together as to disturb the circulation. The edges are now brought together with silkworm-gut

sutures (*b* and *c*, Fig. 2). This line must be delicately placed so as to leave sufficient tissue between this and the preceding row of sutures, for it is on the vascular integrity of this tissue that the success of the operation depends.

A cross-section of the line of repair (*d*, Fig. 2) shows the first two lines of sutures inverting the bladder wall into the bladder, while the staple suture inverts the vaginal wall into the lumen of the vagina. The coaptation sutures uniting the edges of the bladder wall show a too generous bite in the figure. These should include as little tissue as possible.

A permanent catheter is placed and is allowed to remain a week or ten days. Care must be taken lest the lumen of the catheter becomes occluded.

The staple sutures remain in position about three weeks.

BILATERAL TUBAL PREGNANCY WITH RUPTURE OF BOTH TUBES

BY HAROLD H. JOHNSON, M.D., AND JOSEPH S. DIASIO, M.D.
NEW YORK CITY

(From the Gynecological Service of Dr. P. H. Williams, Lincoln Hospital)

A REVIEW of the literature for the past seven years revealed reports of ten cases of bilateral tubal pregnancy. In one of these cases rupture occurred in both tubes. Therefore, we believe, the condition is rare enough to justify the report of the following case.

Mrs. C. C., aged thirty-seven, married ten years. One miscarriage nine years ago and one forceps extraction two-and-one-half years ago. Menses regular for the past year. No operations.

The patient was admitted to Lincoln Hospital on February 16, 1928, complaining of occasional attacks of cramp-like pain in the lower abdomen, especially in the left lower quadrant, for the past six weeks. Three days before admission she was seized with a very sharp pain in the left lower quadrant with a simultaneous sensation of faintness, and has had several severe attacks since. Vaginal bleeding, spotty in nature, but never very profuse, has persisted since onset. She had her last regular menstruation on November 21, 1927, and flowed twelve hours on December 19, 1927. Several days after the onset of the present illness, the husband called his private physician who treated the patient for miscarriage, later for "incomplete abortion," up to the day of admission to the hospital.

The patient was pale with a lemon-colored look. She appeared to be in a state of collapse. There was a severe anemia of the mucous membranes and conjunctiva. The head and neck were normal and the nose and throat clear. The heart was normal in size and position, the rate rapid, the rhythm normal, but no murmurs were heard. The lungs were negative except for a few mucous râles heard over the larger bronchi. The abdomen showed a fullness in the lower part, tenderness on pressure in both lower quadrants, and general pseudorigidity. Vaginal examination disclosed a soft, tender uterus, a boggy, cystic mass filling the pelvis, exquisite

tenderness in both fornices, and a slippery, dark, bloody discharge from the cervix. The temperature was 98.2° F.; pulse 96. The patient looked ill.

Urinalysis of a voided specimen disclosed: specific gravity 1030, reaction acid, albumin trace, sugar and casts negative, pus cells two per high power field, a few calcium oxalate crystals, and a few epithelial cells. The blood examination showed: red cells 2,560,000, hemoglobin (Dare) 40 per cent, leucocytes 13,100, polymorphonuclears 74 per cent, large lymphocytes 1 per cent, small lymphocytes 25 per cent.

A clinical diagnosis of ruptured ectopic gestation was made and the patient ordered to the operating room.

The abdomen was opened under ether anesthesia. The left tube was found attached to the fundus uteri by fresh adhesions. The distal half of the tube was distended, with an opening 3 cm. long, filled with blood clot and organizing material, and covered with omentum and small intestine. The right tube was enlarged and, with the ovary, was adherent to the uterus, bladder and small intestine. Both tubes were removed and a ventral suspension performed.

Examination of the specimen showed, in the left tube, a distention of the distal half, with an obvious tear, filled with blood clot. The right tube was distended throughout. In the middle third was a tear $\frac{3}{4}$ cm. long with a blood clot protruding through it. Section showed chorionic villi and hemorrhage.

The patient made an uneventful recovery and left the hospital February 29, 1928 (thirteen days after the operation) having been up and around the ward for two days, feeling fine and happy.

119 EAST EIGHTY-FOURTH STREET.

EARLY ADENOCARCINOMA OF UTERINE BODY COMPLETELY REMOVED BY CURETTAGE

BY SAUL SEIDES, M.D., F.A.C.S., BROOKLYN, N. Y.

IN AN article entitled "A Plea for Early Diagnostic Curettage and Routine Microscopy of Curettings for the Detection of Adenocarcinoma of the Uterus," appearing in the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY, February, 1928, Dr. L. J. Ladin reports two cases, in addition to the three previously reported by him, of adenocarcinoma of the uterus, limited to the endometrium. In four of these cases the curette succeeded in completely removing the malignant growth.

In reviewing the literature Dr. Ladin brings out the following facts:

In 1915 no record of a similar case could be found in American or British literature, while 19 cases were previously reported in German and Austrian literature. Shortly after the publication of his paper, in 1915, similar case reports began to appear. In France, Muret reported four cases in 1915. In Holland, Van de Poll reported one case in 1917. In this country, R. T. Frank reported a case in 1915, S. Wiener, one case in 1917, and Palmer Findley two cases in 1917. Since then a search of the literature fails to show the record of a case.

The case reported here makes the number of cases on record in American literature 10, and the total number reported, 34.

Mrs. T. J., aged forty-one, was admitted December 5, 1927, to the United Israel-Zion Hospital, complaining of irregular bleeding of seven months' duration. The patient had been married nineteen years, para vi, gravida vii, last pregnancy six years ago. Family history negative. For the last five years the patient has been under treatment for diabetes. Operated on twice for glaucoma seven years and two years ago. Menses regular, every four weeks, lasting five days, flow moderate, no intermenstrual discharge. For the last seven months her menses changed, the flow appearing more frequently and at irregular periods. Last menstruation occurred November 19, 1927, and lasted five days. November 30 the bleeding reappeared and has continued since.

Physical examination, negative.

Vaginal examination: perineum slightly lacerated, pelvic floor fairly firm. Vagina filled with clots. Cervix markedly lacerated. Uterus enlarged to the size of a six to eight weeks' pregnancy, retroverted. Adnexa not palpable. R.B.C., 4,000,000;



Fig. 1.—Photomicrograph showing solid groups of squamous cells partly infiltrating the stroma. There is a direct connection between the cylindrical epithelium of the uterine glands and the squamous epithelium.

Hb., 78 per cent; W.B.C., 9,000; polys, 74 per cent; urine, 1.4 per cent sugar, otherwise negative. December 6, I performed a diagnostic curettage, and the specimen was submitted for microscopic study to Dr. M. A. Goldzieher, who on December 9 reported as follows:

Sections from the curettings showed a markedly hyperplastic uterine mucosa. The interstitium of the mucosa is cellular. There are quite a few lymphocytes, plasma cells, and polynuclear leucocytes. The uterine glands are numerous. Their longitudinal sections are tortuous, whereas the cross-sections are often dilated. Many of these tubules are lined with epithelium in several layers, showing evidence of hyperplastic proliferation. Yet the irregularities of the individual cells and particularly of their nuclei are not very pronounced. In between these hyperplastic tubules quite a few scattered areas of squamous cell epithelium can be met with. These groups of epithelial cells are within the stroma of the uterine mucosa. Occasionally they are in connection with uterine glands, the epithelium

of which shows gradual metaplastic transformation. The individual cells of the fully differentiated squamous cells are much more irregular than those of the uterine glands.

Diagnosis: Early adenocarcinoma of the uterine mucosa.

On the strength of this report I performed panhysterectomy under spinal anesthesia and submitted the specimen to Dr. Goldzieher whose report follows:

Examination of the uterus after its surgical removal showed a fairly well regenerated mucosa on its inner surface. There are only a few areas on which the regeneration of the mucosa still lags behind. The stroma of the new mucosa is

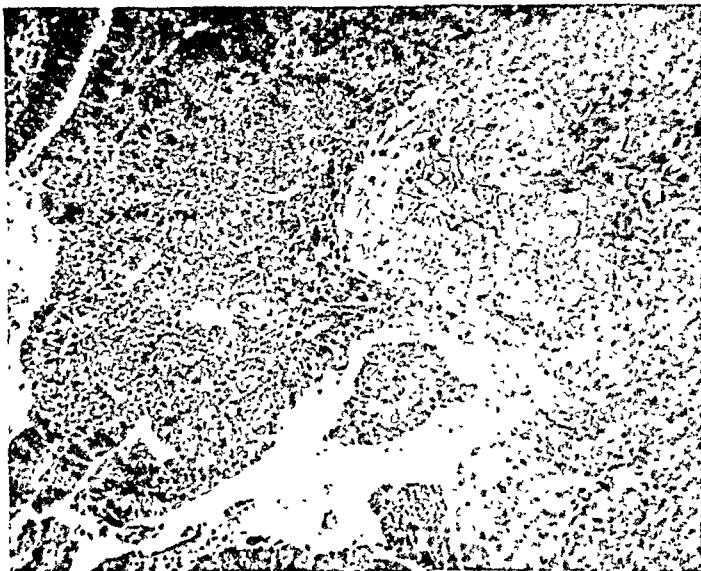


Fig. 2.—Photomicrograph showing solid nest of keratinized squamous epithelium adjacent to intensely proliferating tubular glands. The epithelium of the tubular glands is anaplastic.

diffusely infiltrated with round cells. The uterine glands are numerous, slightly tortuous. Their epithelium does not reveal any particular irregularities. There are no epithelial elements to be found in the musculature of the uterine wall. Sections taken from the various parts of the uterine wall showed quite analogous behavior.

Diagnosis: Hyperplastic endometritis; no carcinomatous tissue left.

The patient's convalescence was uneventful, and she was discharged from the hospital on the fourteenth day after operation, in good condition.

4510 TWELFTH AVENUE.

Society Transactions

NEW YORK OBSTETRICAL SOCIETY

MEETING OF MAY 8, 1928

DR. PERCY H. WILLIAMS reported a case of **Endometriosis in an Abdominal Scar Following Cesarean Section**. (For original article see page 102.)

DISCUSSION

DR. B. P. WATSON said that Bonney and Davidson reported a case recently where this condition followed in the abdominal scar after an operation for myomectomy.

DR. I. C. RUBIN instanced a case of what one might call a miniature cesarean section, an abdominal anterior hysterectomy, in a patient where not only was the uterus emptied of a two months' pregnancy but also a ligation of the tubes for permanent sterilization was done. The uterus was sutured to the abdominal wall. She developed an endometrioma of the abdominal wall which gave her symptoms of pain and swelling on and off for four years. Dr. Rubin removed the lesion without entering the general peritoneal cavity and she has been free from her symptoms since then.

The mechanism by which the endometrial tissue is transplanted or dislocated into the abdominal wall, in addition to that mentioned by Dr. Williams, is possibly by another method. Dr. Rubin believed that where one fixes the uterus to the abdominal wall either after a myomectomy or after emptying a gravid sac, the suture line sometimes gives with or without a hematoma forming between it and the peritoneum. The endometrial particles can thus escape into the abdominal wound. This is more likely than that the suture drags the endometrium into the abdominal wound.

The point Dr. Williams brought out when he spoke of the possible way in which the serosa gives rise to endometrial cysts, has been definitely demonstrated by Schiller of Vienna, who calls attention to a pathologic process which he terms "prosoplasia," and conclusively shows that endothelium can undergo changes from the flat endothelial cell type to the low cuboidal and high cuboidal cell resembling the endometrial cell in every respect, including cilia. This process can affect the cells arising from the endothelial lining of the serosa, the peritoneal covering of the uterus, or from the endothelium of the lymphatics.

DR. W. H. CARY believed that there is another method by which implantation could happen easily in the fixation of the uterus. Most of us in bringing the uterus up into the abdominal wound for denudation and placing of sutures, use a sharp tenaculum forceps to take hold of the uterus, which very possibly pierces the body of the uterus and enters the mucosa, and that portion of the uterus is the one that is usually brought into coaptation with the muscle at the time the fixation is done.

DR. E. W. HOLLADAY stated that recently at Bellevue Hospital a case was observed in an unmarried girl, operated on in some other hospital two years before. Ever since then, every time she menstruated blood was discharged from the wound. They were unable to identify a true fistula there on subsequent operation. Dr. Holladay asked whether this was a similar case.

DR. WILLIAMS (closing) said in answer to Dr. Holladay that in the reports of these cases there were none described where there was an actual discharge of fluid from the tumor itself.

Answering Dr. Rubin, he stated that the serosa has been described as developing all sorts of epithelial tissue, but it would seem that this peculiar type of tumor, if it had to do with the endothelium, would be found in males as well as in females, and he did not know that one has ever been described in a male.

DR. J. C. LITZENBERG, of Minneapolis, Minn. (by invitation) presented a series of **Gross Microscopic Sections From Specimens of Ectopic Pregnancy.**

DR. J. L. HUNTINGTON, of Boston, Mass. (by invitation) presented a **Review of the Pathology in 104 Consecutive Miscarriages in Private Obstetric Practice.** (For original article see page 32.)

DISCUSSION

DR. GEORGE L. STREETER claimed that there are all kinds of eggs. He then showed a series of slides illustrating that throughout a great variety of plant and animal forms there has been demonstrated to exist a wide variation in the degree of vitality of seeds and eggs. Among the mammals that have plural births and particularly those with large litters, it has been proved that regularly from 20 to 30 per cent of the fertilized eggs fail to develop properly, and the blame can only rest on the male or female zygote. Dr. Streeter went on to say that in the human being we have to look at it in a rather particular way. In certain families there is a poor strain of eggs. We might expect certain patients habitually to ovulate eggs of poor vitality which develop only when other things are most favorable, or never at all. In other families some eggs are defective, so that they alternate between successful pregnancies and abortions. Some women seem to ovulate extraordinarily vital eggs and become pregnant at every opportunity; they are prolific and mothers of large families.

Men differ in constitutional vitality. Some men grow to old age, living a long, vigorous life. They abuse themselves; they overeat; they seem to work too hard; they do all the wrong things; maybe they take no exercise; yet they seem to live to be old, vigorous men. Those are good eggs. The average man reaches the age of fifty or sixty. Some live only until they are twenty and then fall by the way. Of course, others die in childhood, and there is a great mortality in the first year of life.

It seemed to Dr. Streeter that many of Dr. Huntington's cases are instances where the vitality is so poor they cannot get through the mechanism of development. To develop all the organs is a considerable task. Many of the eggs never accomplish that. There are more deaths in the first week of development of the ovum than at any other time and these deaths are never recognized, because there could have been no other evidences of pregnancy. It is in the very earliest specimens, if we could only get them, where we would find the greatest mortality.

DR. J. C. LITZENBERG said that in his clinic basal metabolism studies of several thousand women were made and among them several hundred women showed a moderately low basal metabolism. It seems reasonable to suppose that this would have an effect on conception and the ability to carry the product of conception, when we stop to think that in low basal metabolisms, like exophthalmic goiter, conception is rare, and conversely in myxedema we expect sterility. Therefore, we

might well conclude when a patient borders upon myxedema or on a high basal metabolism that we might get a relative sterility.

A study showed that in the women with a low basal metabolism the number of their children was much below those with normal basal metabolism. There were more living children per mother in those with normal basal metabolism, and among the women with low basal metabolism (minus 12 or 15, or 24 or 30) an astonishing history of abortions was given; they had many, many more abortions per mother than those with normal basal metabolism. Having obtained this lead they continued the investigation in a longer series, and it has come out the same way—those with normal basal metabolism have more living children per mother and those with low basal metabolism have more abortions per mother.

DR. ELIOT BISHOP was struck by the heresy that neither retroversion, nor intercourse, nor automobiles have much to do with miscarriages. He wanted to know how often the doctor has Wassermann reactions done on private patients with no apparent lesion. He remarked that nothing was said about the subject of the bacillus of Bang or the *Bacillus abortus* as a cause of miscarriage; this has been worked up by the veterinarians a good deal and DeForest carried over the study among human beings some years ago.

DR. G. L. MOENCH said that years ago it was always the woman who was blamed in cases of sterility or habitual abortion, and he wondered if we are not still tending somewhat in the same direction and not stressing sufficiently the rôle of germ plasm defects in the male. Dr. Streeter, as biologist, probably takes it for granted that we remember the fact that the spermatozoon as well as the ovum may be poor, but this truth is rather often slighted by medical men.

For a number of years Dr. Moench had been investigating especially the male side of sterility, and it is quite remarkable what a relation there seems to be between the micropathology and the biometrics of the semen, and the clinical fertility. Conklin, of Quebec, working with the rooster, showed that sexual overloading or deficient physical condition of the animal influenced the hatching of the eggs. The number of eggs fertilized remained about the same, but the death rate in ovo, especially the late death rate, was tremendously increased. W. L. Williams, working with cattle, showed that the number of services required per achieved calf was a direct indicator of the fertility of the bull, and the greater the number of services required, the greater invariably the abortion rate.

In human beings the importance of the male germ plasm defects is very impressive. Not long ago he examined the semen of a man whose wife had had a child only a few months before. According to our standards, however, the semen was very poor. On questioning the woman it was learned that shortly after she had conceived, her husband had fallen off a ladder, had been in the hospital for six months, and still was in very poor physical shape. In another instance the semen of a man, whose wife had had a number of children and then several abortions, was definitely poor. Here it was found that the husband frequently worked from six o'clock in the morning until twelve o'clock at night.

Not only the morphology of the semen, but also the biometrics of the sperm head are often found abnormal in cases of habitual abortion. Instead of the normal, or Gaussian curve, which Dr. Streeter showed, we get curves which are flattened, irregular, and skew toward one side or the other. In one case of sterility where otherwise we could not find anything the matter with the woman or the man, the skewness factor of the curve obtained from measuring the length of the sperm heads was over five times the probable error; and in biometrics any factor more than four times the probable error is considered significant.

Dr. Moench said that he was at present trying to learn something about the morphology of the spermatozoa by dissecting them with a Chambers' microdissection instrument. He found variations of elasticity in different sperm heads, and cited these rather randomly chosen findings with a view of proving that it is important to keep constantly in mind that in every case of disturbed fertility the man must be considered as big a potential factor as the woman. The ovum may be poor but the spermatozoon may also be defective.

DR. J. M. MABBOTT asked whether the period during which the dead fetus is carried before expulsion has been a matter of study. In that connection he wanted to describe a case of a woman who had had two healthy children and who then became pregnant and was told by her obstetrician that she was developing all right. About two or three weeks later she was told that the fetus had died, and then, unfortunately, she was told again, "No, you are progressing favorably." This woman had an abortion with a complete sac, which Dr. Mabbott saw, being the first doctor present in the emergency, a spontaneous delivery. This was ten and a half months after the probable date of conception, and the fetus was certainly no more than seven weeks old, so that it had been carried after its death for probably over eight and a half months; at any rate, it had been ten and a half months since the last menstruation.

DR. HUNTINGTON (closing) said that he had Wassermanns done only on patients where abortion occurred, to determine the etiologic factor. He knew nothing about the question of infectious abortions.

As to the legal question in the State of Massachusetts there is no law whatever in regard to abortions. Unless it is a criminal abortion, the attending physician is not required to pay the slightest attention to it as far as the law is concerned, and the products of conception may be thrown away, or studied, or ignored entirely.

Dr. Huntington wanted to emphasize again the fact that it was highly probable that the male was responsible for a great many of these cases of defective germ plasm.

In connection with the length of time that the products of conception have been retained: in a paper that he read five or six years ago he stated that in 38 cases, 1 was retained two weeks after development ceased, 1 two and one-half weeks after, 4 three weeks after, 1 four and one-half weeks after, 5 five weeks after, 2 seven weeks after, 2 seven and one-half weeks after, 3 eight weeks after, 1 eight and one-half weeks after, and 1 ten months after development had stopped.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF MARCH 2, 1928

DR. LEO S. SCHWARTZ read a paper on **The Treatment of Uterine Injuries.** (For original article see page 66.)

DISCUSSION

DR. H. B. MATTHEWS said that undoubtedly the quicker these patients are operated upon after the injury, the better the chance of saving them. If the patient is in shock, naturally you stop the bleeding and treat the shock, and then endeavor to find out the extent and location of the injury. Many of these lower uterine injuries, particularly if they are into and within the confines of the broad ligament, need nothing more than control of the hemorrhage by pack and need no further operative procedure at this time.

As to the other class of injuries in early pregnancy, namely, the perforations, Dr. Matthews claimed that the earliest possible diagnosis of the injury, with opening of the abdominal cavity, is demanded, and where the rent is of considerable size, complete hysterectomy should be done, perhaps with conservation of one or both ovaries.

Dr. Matthews did not agree with Dr. Schwartz that the conservative procedure is the better, but that treating these perforations of the uterus is comparable to treating gastric or duodenal ulcer.

DR. ELIOT BISHOP felt that certain of these injuries can be treated conservatively, such as a clean case of incomplete miscarriage where the end of the sound had gone through. If the uterus is perforated and intestine or omentum is brought down, that is another proposition; we can liken that to a perforated duodenal or gastric ulcer. Dr. Bishop did not believe that one can liken a clean uterine fundus to the perforation of a dirty bowel.

There is one other type of injury Dr. Schwartz did not mention, which apparently has not been noted in the literature at all. During the process of curettement, we may, without knowing it, perforate the cervix between the internal and the external os, into the broad ligament, with an extremely exasperating hemorrhage from the big veins.

DR. C. A. GORDON called attention, in regard to the question of the conservative treatment of rupture of the uterus, to some figures presented at the last meeting. After analyzing 1805 cases of cesarean section, there were 11 cases of rupture of the uterus with 3 deaths. Three occurred after one previous section, one after two previous sections, and one after three previous cesareans. Three followed forceps, two followed version, and in one the etiology was unknown. The point is this: four had hysterectomy, and in seven the wound was resutured. The seven in which the wound was resutured all got well. The three deaths occurred in those that had hysterectomy. One case that had hysterectomy got well. The seven cases resutured all got well.

DR. A. KOPLOWITZ said that one is not always sure of having perforated the uterus because a certain degree of relaxation of the uterus occurs and the sound goes up pretty high without damage. Where there is any doubt we should give such a patient the benefit and leave her alone unless something has been pulled down, such as a loop of gut.

DR. H. M. MILLS recalled a number of cases where an intern was trying to curet the uterus for retained secundines, perhaps at the third month of gestation, when suddenly the curet went in up to the handle, and the fact became apparent that there was a perforation of the uterus. Such patients should be left alone, and Dr. Mills claimed he never saw one of them die.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF APRIL 13, 1928

DR. A. S. MACGREGOR presented a preliminary report on **The Effects on Blood Pressure of Pituitrin and Oxytocin in the Puerperium.**

Textbooks have handed down many obstetric statements which are not confirmed by clinical observations. It has been taught for years that it is dangerous to use pituitrin to secure uterine contractions in cases of toxemia because of its tendency to elevate the blood pressure and thereby possibly precipitate convulsions.

This hesitancy to use pituitary extract in the presence of elevated blood pressure prompted this study of the effects of the drug on blood pressure. In addition, a

BLOOD PRESSURE EFFECTS PITUITRIN AND OXYTOCIN AVERAGE SYSTOLIC READINGS

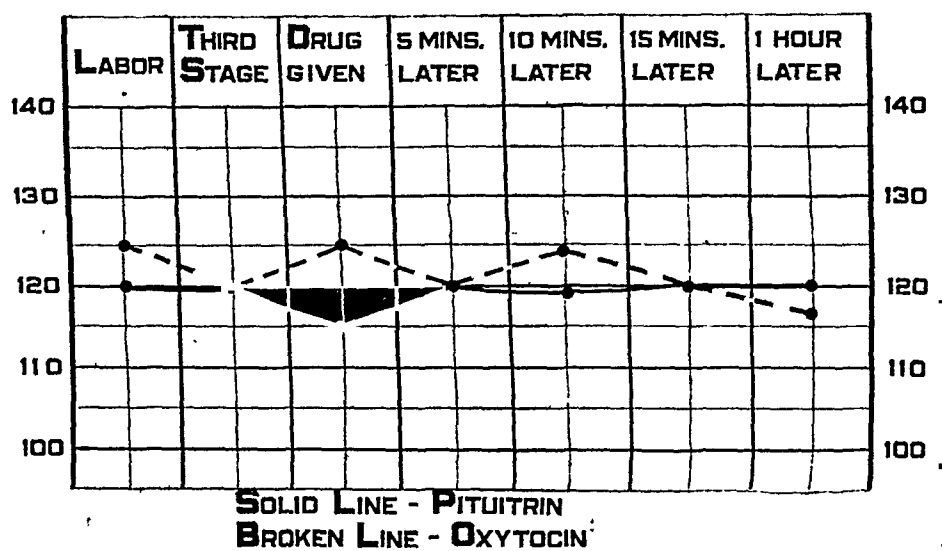


Fig. 1.

new preparation, oxytocin, has been used. This is said to be a pituitary extract free from the pressor element but still retaining the oxytocic principle.

From a study of the behavior of the blood pressure during the first, second and third stages of labor for several years, it was learned that in the course of normal labor, there are certain fairly constant variations. During the first stage, unless it is prolonged to the point of exhaustion, there was noted no change. In the expulsive stage, however, straining effort may raise the pressure five to ten millimeters only to have it fall again during the third stage.

In eclampsia, the fall following delivery is much more marked, a drop of 50 to 100 mm. often occurring with a subsequent slow rise to a mean safety level.

Does pituitrin alter this pressure reaction by suddenly raising the blood pressure or by maintaining it at a high level, thus defeating what appears to be nature's safeguard? This was the question in mind when undertaking this study.

This preliminary report is based on a study of sixty cases of which thirty received one ampule of pituitrin upon expulsion of the placenta and the remaining thirty, one ampule of oxytocin. These sixty cases all had blood pressures which were within the limits of normal during their pregnancies and labors, all received chloroform anesthesia and none of the deliveries were attended with any degree of shock sufficient to effect the blood-pressure readings. The pressure was noted during labor, during the third stage, immediately after the expulsion of the placenta (at which time the oxytocic agent was given) and at intervals of five, ten, fifteen, and sixty minutes thereafter.

The average blood loss in the cases in which pituitrin was given was approximately the same as that in which oxytocin was used and there seems to be very little if any difference in the rapidity of and duration of the action of these two drugs. Taking an average of the systolic blood-pressure readings as recorded, there was noted no marked nor uniform tendency for either of these drugs to elevate the blood pressure.

Only nine cases in which pituitrin was given showed a rise of 10 mm. or more. This rise occurred in five to ten minutes after administration of the drug, was not sustained and in no case was more than 16 mm.

Seven of the cases given oxytocin showed a similar elevation of 10 to 12 mm. and here again the rise was not sustained.

Both drugs were given to a number of toxic patients and there was no marked tendency to elevate the blood pressure nor to prevent the fall in pressure so often noted in such cases.

In several instances, more than one ampule of the drug was given. These cases also showed no marked tendency toward an elevation of pressure any more than did those in which only one ampule had been given.

DR. GEORGE GRAY WARD read by invitation a paper on **Radium Therapy of Carcinoma Uteri, Based on Ten Years of Clinical Experience and Results at the Woman's Hospital.** (See page 1 for original article.)

DISCUSSION

DR. WILLIAM SIDNEY SMITH said that the use of needles in conjunction with the tubes gave better results than tubes alone, screened in platinum. Dr. Ward screens his radium with brass, and probably gets some beta-ray action. Dr. Smith said that in the Brooklyn Hospital they screened radium with one millimeter of platinum, and did not get any beta-ray action. Possibly that makes some difference in the results.

Dr. Smith never considered it necessary to use a catheter in the bladder and his patients usually voided, even though they had a large pack in the vagina. The radium has always remained in place when it is used in the cervix with a small strip of narrow gauze about one-fourth inch wide packed around it, and the vagina packed full of gauze. At the Brooklyn Hospital it was not found necessary to sew the radium in the cervix, except for a metritis, and doing a repair of the cervix, or perineum at the same time. Dr. Smith then described the experiences with radium at the Brooklyn Hospital. There were only 68 cases of cervical carcinoma divided into the early and the advanced cases, numbering 56, and only 12 that could be considered early cases in which there was no demonstrable induration in the broad ligament, and in which the fundus was movable. In the 56 advanced cases they simply used radium as a palliative method of treatment. It stops hemorrhage, clears up a great deal of foul discharge, and above all, it makes the patient feel that something is being done.

Of these 12 early cases, one patient received radium and the disease spread very rapidly. This patient received a 2400-hour dose of radium. In one month the disease had spread like wildfire, and she died in six weeks, although Dr. Smith did not believe that the radium treatment had anything to do with her death.

G. I. Strachan, in the *Journal of Obstetrics and Gynecology of the British Empire*, for 1927, is sponsor for the statement that there is no evidence to show that radium treatment will make cancer spread.

In this group there were two cases of carcinoma of the cervix which were treated with radium, and later subjected to abdominal hysterectomy, both with unfavorable results. One of these patients had been operated upon, before she came under observation, for repair of the cervix and perineum. She apparently had no disease whatever. Three years later she came to the hospital with a history of slight spotting for six months, between periods. She was a widow, thirty-nine years old, and had not yet gone through the menopause. Carcinoma was suspected. There was absolute mobility of the entire uterus, with nothing to feel in the broad ligament. She was given a 2400-hour dose of radium. Spotting stopped, and one month later she was subjected to a total hysterectomy. There was no induration noted on operation. She made an easy convalescence. Three months later she came back to the hospital, and on routine examination a small nodule was felt in the scar. A small piece of it was taken off for biopsy, and immediately, she was given another 2400-hour dose of radium. She remained in good health for one year, when the disease began to spread out through the parametrium, and she died six months later.

Another case, a widow of thirty-two, came to the hospital with an extremely eroded cervix, and a large, hard fundus. She had bled considerably. We considered the diagnosis to be metritis rather than carcinoma. On investigation, however, it was found to be a carcinoma. She was transfused with 1000 c.c. of blood, and given a 2400-hour dose of radium. In one month the cervix had shrunk so much that it was normal in size. She was apparently perfectly well; she then had a total hysterectomy, and remained well one and one-half years when the disease spread out through the parametrium, and she eventually died.

At the Brooklyn Hospital the experience with radium, followed by total hysterectomy, has not been favorable. There were only two cases, but both terminated fatally.

The remaining 8 early cases were treated with radium in conjunction with the Byrne operation (long-continued roast with the cautery), and they form the best group of cases. Of these 8 patients, one died of recurrence two years after treatment (the only one). One has been lost to follow-up. One is in good health two years after treatment. One is in good health three years after treatment, one five years after treatment, two, seven years after treatment, and the other one is in good health eight years after treatment. So, according to the five-year rule, which Dr. Ward has laid down, there were 4 cases out of 8, or 50 per cent, alive and well, five to eight years after treatment.

Only two bladder fistulae were noted, and they occurred following the use of cautery. One was subsequently admitted to the Woman's Hospital and operated upon by Dr. Grad, who thought she was entirely free from cancer, and he cured the fistula by operation. The other patient still has the fistula. It is not a very bad one, and bothers her very little. She is one of the five-year cases, and is still in excellent health.

Comparing their statistics with those reported by Drs. John G. Clark, and Ferguson, in the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY*, February, 1927, who used radium similarly to Dr. Ward, in tubes and needles, screened in about the same way, they report that radium alone cured 4 out of 68 cases. Where

they amputated the diseased cervix with cautery and then used radium, they cured 6 out of 14 cases, or 42.9 per cent of five-year cures, as compared with 50 per cent at the Brooklyn Hospital.

In regard to the use of radium before operating in adenocarcinoma of the corpus uteri, they feel that if radium would slow up the cancer, these patients should be theoretically in better shape and better prepared to be operated upon a month later than if radium had not been used. Theoretically, it seems to Dr. Smith that it is a good thing to do.

There were 24 adenocarcinomas of the corpus, 11 fairly early cases, and 13 advanced, in which there was fixation of the fundus. Radium in the latter cases was used merely as a palliative measure. Radium alone was used on one early case with heart trouble, a poor operative risk. She remained in very good shape for four and one-half years, but then she had a recurrence. If the patient is in the operable class, Dr. Smith believes it is better to take the uterus out, and that the best time to do the operation is about a month after radium treatment. They had two deaths after hysterectomy, done after radiation, and operated early. Both patients died from sepsis and from general peritonitis.

Of the early cases of carcinoma of the corpus which were treated with radium and operated one month later, 2 have been lost to follow-up, 1 is in good health five and one-half years after operation, 1 four years after operation, 2 three years after operation, and 1 one and one-half years after operation.

Dr. Smith still uses 2400 milligram hours of radium within the corpus as a preliminary treatment to a total abdominal hysterectomy (one month later) in early cancer of the corpus uteri, because it seems wiser to curtail the cancer growth before subjecting the patient to a cutting operation. In this he differed from many authorities who believe the patient's best chance lies in an operation immediately after the diagnosis, or a presumptive diagnosis is made.

Notwithstanding what we have learned from Healy and others in regard to the way in which the different types of cancer cells react to treatment, Dr. Smith felt that the effect of radium on a particular case cannot be foretold. It may be brilliant or nil, so that prognosis should be guarded.

Where should cancer of the uterus be treated? Some say it should be treated only in large institutions where they have a large amount of radium. That may be true; perhaps they get better results in large institutions, but there are so few of them, and there are so many cases of cancer! Certainly the small institutions, or the institutions with only a small amount of radium, can do, as Dr. Ward has demonstrated, brilliant work with a moderate amount of radium used in repeated doses.

DR. C. A. GORDON asked Dr. Ward on what kind of a case and for what reason, since the radium results are so wonderful, he would do a Wertheim operation.

The five-year basis is an arbitrary method of tabulating cancer statistics. Dr. Gordon wondered whether anyone has followed the five-year cures and traced them for a longer period of time; whether, in short, that is a fair and safe basis for the determination of cure of cancer of the cervix or not. He also asked why in operations for cancer of the uterus we can sometimes save the most advanced cases and why it is not an uncommon thing at all to have a terrific spill of carcinoma tissue in the peritoneal cavity and still get a cure, and not have metastasis anywhere in the pelvis afterwards, if the patient should not be cured.

Moreover, is there any danger when passing a needle through the cervix of carrying through from the cervical canal any cancer cells to the blood vessels, and so carrying the carcinomatous process outside the cervix?

DR. WARD (in closing) wanted to congratulate Dr. Smith on getting 50 per cent of cures in his early cases. The trouble is we see so few early cases.

As to the use of the self-retaining catheter, Dr. Ward said that early in the work considerable trouble was caused by the fact that the nurse could not find the urethra to catheterize the patient, and the patient could not urinate with the vagina packed tightly with gauze. It is essential to keep the bladder or rectum as far as possible from the radium. The catheter works satisfactorily, and it never bothers the patient. Furthermore, where radium is used in the fundus of the uterus, it is well to keep the bladder collapsed and empty all the time, as the distended bladder would lie close to the radium in the fundus. The catheter in situ has been a very valuable aid in preventing vesical irritability.

Dr. Ward agreed that radium for cancer of the fundus when used alone was not a safe procedure and he preferred to take the uterus out after radiation, but radiated first. The majority of carcinomas of the fundus require a diagnostic curettage to see if we are dealing with a polyp, and it is easy to place the radium at that time and then take out the uterus subsequently.

In 50 per cent of cases of carcinoma of the fundus, there is some reason why we cannot operate. They are old women, very often they have diabetes or cardiovascular disease, and are poor surgical risks.

Dr. Ward recommended the cautery with radium in all cases with an exuberant growth projecting into the vagina. He did not use the cautery in a case which was distinctly localized early in the cervix itself and had not attempted to do the Byrne operation of amputating the cervix.

Dr. Gordon asked why, with such brilliant results with radium alone, cases of the Wertheim operation and radium are reported. Those cases were all done in 1919 and 1920 when he first obtained the radium, and was feeling his way. In some of those early cases he used the radium and then the Wertheim afterwards, but since that time had not done any Wertheim operations but relied entirely on the radium. These cases, however, are not included in the radium statistics.

In answer to the remark about the five-year cure, the term is accepted by all men who are working with radiologic statistics. It simply means alive and symptom-free at the end of five years. By no means does it mean that the patient is permanently cured. Cases might be all right for five years and die later, 6, 7, 8, or 9 years, of carcinoma. Symptom-free means subjectively symptom-free, because many of these cases if examined show some infiltration, but the patient is symptom-free as far as she knows, well and able to do her work, with no gross evidence of disease apparent.

As to the use of needles, Dr. Ward believed he got some fistulae because the needles were too close together. Formerly he used 100 milligrams and 6 needles as the initial dose. He found it is much better not to put the needles closer than within 2 cm. of each other, therefore, in the average case he now uses 4 needles and 100 milligrams of radium unless the growth is very large when it will easily take 6 needles because of the excessive size of the cervix.

He did not fear spreading the disease by passing the anchoring suture through the cervix, as one does not hesitate to do a biopsy, which is an accepted procedure.

NEW ORLEANS GYNECOLOGICAL AND OBSTETRICAL SOCIETY

MEETING OF APRIL 19, 1928

DR. E. L. KING read a paper entitled **Fetal Mortality in Breech Presentations. Is Prophylactic External Version Advisable?** (For original article; see page 78.)

DISCUSSION

DR. HILLIARD E. MILLER did not believe that a breech delivery should carry with it a higher mortality than other kinds. He said that even in cases of impacted shoulder, deep surgical anesthesia, preferably with ether, makes the procedure relatively simple, and the routine performance of episiotomy lessens the risk for the mother. By observing these few points, plus ironing out the vagina and waiting until the breech appears on the perineum before delivery is attempted, he has had uniformly good results in these cases. Good assistance is extremely important. If the membranes rupture early the insertion of a bag is the safest plan. It is well to remember that all manipulations must be extremely gentle, particularly when the hand is placed in the child's mouth, for fracture of the jaw is easily produced by the exercise of undue force.

Dr. Miller had no experience with prophylactic external version, because he saw no indication for its use, when breech delivery is so largely a simple and safe procedure.

DR. J. S. HEBERT said that the high fetal mortality in breech presentations, as shown by statistics collected by Dr. King, was a surprise to him. He would agree with Dr. Miller that the figures are frightfully high. With prophylactic external versions he had no experience except for a few cases so handled in the Charity Hospital. The results have not been satisfactory. Labor might be precipitated, severe hemorrhage from disturbed placental circulation or possibly malpositions may result, therefore he did not consider the operation advisable.

DR. KING (in closing) said some of the babies in his series were autopsied. They died of birth injuries, rupture of the adrenal, intracranial hemorrhage, etc. His figures are about the average as given in textbooks. His cases of primiparae showed a lower fetal mortality; this may be partly due to the fact that the obstetrician had time to get to the patient and render the necessary assistance. Some French writers advise no assistance until the shoulders and arms are delivered spontaneously. He believes that anesthesia is a great aid. Dr. King waits until the breech is on the perineum, then puts the patient to sleep and delivers the baby. He believes that we should teach that breech presentation is not easy to handle, and further that breech cases should be hospitalized, at least good assistance should be available, as one may be faced with a complicated operative delivery.

DR. LUCIEN A. LEDOUX read a paper entitled **Some Physiologic Aspects of Eclamptic Toxemia.** (For original article, see page 90.)

DISCUSSION

DR. H. VERNON SIMS remarked that Titus has recently shown that there is a hypoglycemia in eclampsia. A 25 per cent solution of glucose is given by him intravenously with the Stroganoff treatment. Labors are not terminated. All cases are handled in this way. Only one death is recorded.

Dr. Sims believes that after careful prenatal care, if the patient begins to develop symptoms, rigorous preeclamptic treatment should be started. If this does not help, the labor should be terminated.

DR. T. B. SELLERS has tried heparmone in four cases of preeclampsia, two were frank preeclampsics, two were nephritic toxemias. His results with heparmone in true eclampsia were quite gratifying, but the patients with nephritic toxemia were not benefited at all. He gave heparmone, two to four doses, in several cases just before labor started, but was unable to draw conclusions. Dr. Seller's experience with glucose in the treatment of pernicious vomiting of pregnancy has been that it is worthless unless given intravenously and he prefers to give small doses of insulin along with the glucose.

DR. J. S. HEBERT believes that the complicated chemical and functional alterations, characterizing the normal physiology of pregnancy, signifies the gradual adaptation to the exigencies created by pregnancy. In the constitutionally deficient woman, be it in organ or organ systems, adjustment is sluggish or possibly imperfect. Inadequate adjustment constitutes the pathologic physiology of pregnancy, expressed in a symptom complex and best described as the toxemias of pregnancy. Dr. Hebert believes that the underlying weak points are usually found in the gastrointestinal tract, the endocrine system, or in the cardiovascular renal system. He considers that Dr. Titus has given conclusive evidence that in eclampsia there actually exists a disturbed carbohydrate metabolism and that convulsive seizures occur at levels which can be designated as "relative hypoglycemia." There is a rise in blood sugar following convulsions, a natural physiologic response of the liver to muscular activity.

DR. E. L. KING mentioned the work Dr. R. C. Cross has been doing on liver function test in normal pregnancy. Dr. Cross finds that in normal pregnancy, the various liver function tests are always negative. In other cases with focal infections, etc., he has found a retention of dye showing a liver dysfunction and degeneration.

DR. LUCIEN A. LEDOUX (in closing) said that he had hoped that the discussion would be more along the lines of the subject presented.

The liver function test he considers a very valuable early or late diagnostic aid. He thinks it should be done immediately on the appearance of one or more symptoms or signs of toxemia, regardless of whether there are any blood pressure or urinary changes.

Dr. Ledoux believes that hypoglycemia when it does occur, is interpreted rather as an effect than as a cause, feeling that it results from a disturbed glycogenolytic function, resulting from the destruction of the liver cells, this occurring usually in the severe cases, where the damage to the liver is extensive.

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING MARCH 16, 1928

DR. W. E. N. DORLAND demonstrated a specimen of the **So-called "Everting" Variety of Papillary Cystadenoma of the Ovary.**

DR. DORLAND removed tumors last October from a woman forty-nine years of age. She presented no symptoms whatever, but had visited her physician for the relief of an acute coryza. Not having seen her for a year, he made a complete examination and discovered a mass in the pelvis, with the presumptive diagnosis of cancer. Dr. Dorland found a nodular and irregular mass lying behind and to both sides of the uterus, fixed in its position and sensitive at spots, and made a diagnosis of probable carcinoma of the ovaries. Three days later he removed both ovaries. They were partially adherent to the uterus, but were readily detached and ligated. The pathologic examination showed bilateral papillomatous cystomas of the ovaries.

These growths are nonmalignant as regards metastasis by way of lymph-channels, but fragments of such tumors may be broken off and swept to any part of the peritoneum where they may adhere and develop into new papillomas, forming so-called "implantation" metastasis.

The everting variety of papillary cystadenoma of the ovary is much rarer than the inverting variety, in which the papillary excreescences are formed on the inner lining of the cyst and not on the outer surface. Because of the great tendency to form secondary implantation-growths on the pelvic peritoneum these everting cysts are very prone to recur, even when no implantation-growths can be detected at the time of operation. Recurrences are very apt to appear within two or three months after removal of the tumors. Six months after the operation, Dr. Dorland found the pelvis clear.

DR. A. H. CURTIS said that he and Dr. Watkins had had a patient with this type of growth in whom a recurrence did not appear until ten years subsequently.

DR. DAVID S. HILLIS reported a case of **Premature Separation of a Normally Implanted Placenta During Pregnancy.**

The case was presented because of the absence of the usual findings which enable one to make the diagnosis, and especially because of the lack of the board-like hardness of the uterus which is so often characteristic of this condition. Many obstetricians have insisted that this sign is often absent, but Dr. Hillis has found it so constantly present that he has come to depend upon it to differentiate premature separation from placenta previa.

Premature separation usually shows signs of shock which are out of proportion to the amount of external bleeding and usually out of proportion to the internal bleeding. The case reported showed absence of shock; the pulse was about 90. The uterus was rather doughy, but not hard. There was a small amount of bleeding externally. Fetal heart tones were absent. The case presented more of the usual findings of a placenta previa than those of a premature detachment of the placenta. It was only after vaginal examination showed that no placenta was in reach of the examining finger that the diagnosis was established in this case. The patient was delivered from below after induction of labor by a bag placed outside the membranes which were not ruptured at the insertion.

In a number of cases in the Cook County Hospital during the last fifteen years, Dr. Hillis managed practically all of them by means of a bag, with such success that he believes this should be the method of choice in the management of most of the cases of premature separation. The membranes are usually ruptured before the bag is inserted on account of the high intrauterine pressure; the patient goes into labor promptly, usually delivers spontaneously and the free use of pituitrin and the uterovaginal tamponade control the hemorrhage after delivery.

DR. CHARLES B. REED read a paper entitled, *Impetigo or Pyodermatitis Neonatorum*. (See page 49.)

DISCUSSION

DR. A. H. PARMELEE said he never knew there was such a thing as congenital impetigo until he started to work on the newborn service at the Cook County Hospital. Since then he had seen about five cases of what seemed to be undoubtedly congenital impetigo. He has not been able to recover any organisms from any of the pustules.

If it is true that this case of impetigo is of congenital origin it must be due to a blood stream infection.

Dr. Reed's paper stressed the idea that there was too much confusion in the various names applied to, what seems to be, one disease of varying intensity, the clinical manifestations depending upon the virulence of the organism and the immunity of the patient.

Aside from the aseptic technic which everyone admits is absolutely essential in handling newborn infants, particularly premature babies whose immunity against infection is invariably very low, trauma undoubtedly plays a large part in these infections. The pustules when they are only very infrequent in occurrence, usually appear at places where the skin is easily macerated. The baby's skin is very sensitive to any kind of irritation.

The problem of whether infected breast milk has anything to do with the situation seems to depend entirely on the question whether this infection is blood-borne or not. Before deciding whether congenital impetigo is due to an infectious organism more data must be at hand than are available at present. Practically all the cases of impetigo, pemphigus neonatorum, and Ritter's disease have in the past, given a culture of staphylococcus. If it is true that a hemolytic streptococcus was found in pustules on the scrotum of the baby reported in this paper, it is evident that there is a new situation to deal with and a wholly new attitude should be assumed toward the disease. Is it not possible that these blebs may be due to irritation rather than of an infectious origin?

DR. JAMES HERBERT MITCHELL said that several years ago, dermatology had been defined as a system of nomenclature. It is interesting to hear gynecologists talk about impetigo rather than pemphigus because dermatologists long have had the feeling that pemphigus neonatorum was impetigo. Dermatologists have a rather definite conception of pemphigus. There are three types which usually affect adults and are not seen in infants; they are not infectious, they are not contagious and they apparently have nothing in common with this neonatorum type. In dermatology three types of impetigo are recognized. One is the impetigo of Tilbury Fox, now generally recognized as due to a streptococcus. He was interested to hear that a streptococcus is rarely found in the newborn; it is common in children and adults. This is a superficial type of large bullous lesions having a very thin wall and rupturing early, leaving nothing more than an erosion upon which the healed up

crust develops. Then there is the impetigo of Boeckhart which is due to the staphylococcus and which forms a little white drop of pus. Then there is impetigo vulgaris, a combination of the two. Oftentimes the streptococcus is there but is overgrown by staphylococcus, and staining agents such as violet green will be necessary to inhibit the staphylococcus. Then there is pyoderma which is known as ecthyma which is likely to occur under the poorest of hygienic conditions or in much debilitated individuals. He is inclined to believe that the streptococcus will be found very much more often than it seems to have been in gynecologic and obstetric work if this causative agent is borne in mind.

The mode of infection interested him because several years ago he showed two cases that puzzled him very much. The infant was born, developed impetigo and there was no possible explanation for this contagion. In spite of everything the child died. Two years ago, the mother gave birth to another child and it likewise died, after which it was found that this mother had a streptococcic focus of infection in the birth canal and in both cases the infection occurred on the scalp, probably during passage.

As regards treatment, oftentimes ointments are not of much value but in the few cases of infant impetigo that he had occasion to treat, complete potassium permanganate baths have proved to be very beneficial. They are easily carried out, are not irritating, and are much more effective than ammoniated mercury.

DR. SYDNEY S. SCHOCHET said it was unfortunate and confusing to have the different phases of the same lesion classified as separate entities. Dr. Reed has given us a very clear analysis of this lesion and broken down the traditional classification.

We can appreciate this new classification if we review the history of these lesions. During the middle of the past century the etiologic factors were considered as systemic and later, through the researches of Hebra and others, were grouped under external causes. At present we believe that the etiologic factors are due to external and internal conditions, such as the metabolic disturbances. In other words, we are accustomed to thinking in terms of gross lesions in the body rather than deranged physiologic function without actual gross lesions and histopathologic changes. A good example of this is found in dermatitis, one of the common lesions in the skin in which we find a degeneration of connective tissue with infiltration. The dermatologist, the pediatrician and clinician do not agree as to etiology. There is no reason that one and the same cause may not give rise to many different clinical manifestations or that the same clinical manifestation may not be the result of many etiologic factors. For this reason we have different clinical names for different phases of the same lesion.

One of the questions suggested by Dr. Reed was whether the staphylococcus is changing its virulence. There is one other factor we should bear in mind; namely, bacteriophage. Most organisms have a substance which we speak of as bacteriophage. It is associated with almost all bacteria, passes through the filter and produces typical lesions.

Toxic substances may also produce lesions of the skin and it may be due to these causes rather than congenital infections.

DR. FRED FALLS had never seen epidemics of so-called impetigo contagiosa in the newborn. All the lesions that have been seen were superficial. He has seen other suppurative lesions apparently give rise to pemphigoid lesions. In one case a breast abscess occurred in a newborn child. This breast abscess followed the demonstration by one of the instructors of "hexen milch" in the baby. The next day it developed a breast abscess in which the staphylococcus was found. In twenty-

four hours a typical pemphigus lesion occurred about two inches from the breast, from which staphylococcus was recovered. As far as the organism itself is concerned, in the lesions he has studied, staphylococcus has always been recovered and it has been seen in the smears as well as in the cultures. He has never seen a typical streptococcus in the smears or been able to culture it. This may be due to a faulty technic but so far as he knows no one has been able to recover streptococcus from pemphigus and fulfill the four laws of Koch that must be fulfilled before an organism can be considered the cause of a disease. This he has accomplished with the staphylococcus, making a culture from a typical lesion, growing it in broth and injecting it into his own arm and producing a typical lesion and recovering from it the staphylococcus in smears and in pure cultures.

Concerning the question of whether there are different varieties of staphylococci concerned, and whether they are the same from a pustular lesion, nonpemphigus in nature, he took the various culture media and ran pemphigus staphylococcus and staphylococcus from a boil through milk gelatin, blood agar broth and various sugars, titrated the acid formation, and tried to differentiate between the two organisms. They were always the same and were so nearly alike that one could not distinguish which was from the boil and which was from pemphigus. The organism recovered was tested as to virulence by injecting into guinea pigs, with negative results. He has seen several breast abscesses arise in mothers who were suckling babies who had pemphigus neonatorum. He has one patient who demonstrated the potential virulence of the organism in which the baby developed pemphigus and the mother developed breast abscess, that did not suppurate. After leaving the hospital she developed a felon on her thumb and died. Staphylococcus was recovered from the felon.

The source of infection has already been brought up by Dr. Reed, that is, contamination from the various personnel. One epidemic at Cook County Hospital was traced to one of the night workers who had a bad acne. As soon as she left the hospital the epidemic ceased. A small epidemic of pemphigus was started in Iowa that was traced to an intern who was on duty while he had a pustular lesion on the neck. Another small epidemic was traced to the fact that undisinfected containers were used to take the linens back to the wards from the laundry. After that was stopped there was no more pemphigus.

It has been his experience that by rupturing the lesion under alcohol and putting on two per cent ammoniated mercury with prompt isolation of the case, the epidemic had been aborted.

Dr. Reed's statement of the length of time it took the lesions to appear on auto-inoculation was incorrect. Dr. Falls injected the organism by taking a needle, dipping it into the culture and injecting it into his arm at about four o'clock in the afternoon and the next morning he had a very nice bleb which was typical and which was without irritation. He simply put the needle under the stratum corneum of the skin where apparently the lesion arises. A control using sterile salt solution was made.

As far as the lesions are concerned which are seen at birth, Dr. Falls did not venture to say to what they were due but he would hesitate to accept the theory that they are organisms that come through the placenta and through to the blood stream and produce the pustular lesions on the baby. Theoretically one would expect more of a severe inflammatory process than the relatively minor disturbances that one sees in these neonatorum lesions.

DR. REED, in closing, said Dr. Falls brought up a very interesting statement regarding the subject of water. Dr. Reed sent out 250 questionnaires and only two or three admitted any contaminations in their maternities since the disturbance in

1917. The condition was so universal that it could hardly be attributed to Chicago water. It is far more probable that the immunity has been diminished by the excess of carbon monoxide from the innumerable motor exhausts.

DR. CHARLES EDWIN GALLOWAY, by invitation, presented a paper entitled, **Anemia in Pregnancy**. (See page 84.)

DISCUSSION

DR. W. C. DANFORTH said that as anemia occurs so frequently in pregnancy some attempt at correcting seemed worth while in as much as some other complication, such as postpartum hemorrhage, would be more serious in a woman who is already anemic.

Treatment during pregnancy is only relatively efficient. Many respond poorly but in some a fair degree of relief may be obtained by oral and intramuscular use of iron or by heliotherapy. The value of the lamp which is at present used in light therapy is not definitely established. It is quite possible that the lamp after being used for some time is not of the same efficiency as at first owing to changes in the glass.

DR. J. P. GREENHILL said that this paper deals essentially with secondary anemia. He also has something to say about pernicious anemia of pregnancy and refers to the fact that it is very uncommon during pregnancy. This holds true for the European countries and the United States but in India a form of pernicious anemia is very common during gestation. Some years ago, Dr. Greene-Armytage, professor of Obstetrics and Gynecology in Calcutta stated that pernicious anemia was frequently encountered in Calcutta. Last year in the *Indian Medical Gazette* there were two papers dealing with anemia during pregnancy. One of the authors analyzed over 400 cases and he believed the cause of the anemia is a toxemia. The other author who reviewed 150 cases is of the opinion that concealed syphilis was responsible for a large number of cases.

DR. C. S. BACON asked how the hemoglobin determinations were made, feeling that the ordinary methods were pretty well discredited. He did not hear any reference to the use of liver in the treatment. Williamson of this city produced secondary anemia in various ways in animals and concluded that the administration of iron in any form, by mouth or hypodermically or intravenously was absolutely without result.

DR. GALLOWAY, in closing, said that there seems to be a fairly close relation between so-called pernicious anemia and certain cases of toxemia of pregnancy. Perhaps some of the cases reported from the Orient might be of toxic origin. The majority of these cases did not have any prenatal care and that practically all the women were seen for the first time in the last few weeks of pregnancy, at term or soon after term. There were no women who would be under the care of physicians. Practically everyone that he could get specific data on were cases that had been very much neglected. He did not run across any animal experiments in pregnancy anemia in the English or German literature.

The hemoglobin estimations were made by the modified Sahli. Some of them were made with the Dare. He told some of the patients to eat liver as he was not afraid of having the pregnant woman eat liver or take a certain amount of meat and wondered whether meat plays a very important part in the toxemia of pregnancy.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

The Hormones of Ovary and Anterior Pituitary

Bugbee and Simond: The Effects of Injections of Ovarian Follicular Hormone on Body Growth and Sexual Development of Male and Female Rats. *Endocrinology*, 1926, x, 360.

Bugbee and Simond experimented with ovarian follicular hormone to determine its effect on bodily functions and to note whether or not it would stimulate body growth and cause a precocious sexual maturity in young female rats. Both male and female rats were used so as to determine whether or not the female hormone exerts any effect on normal or castrated males.

Their conclusions might be briefly summarized as follows:

Castration causes both female and male rats to grow heavier. Subcutaneous injections of ovarian follicular hormone induces loss of weight both in normal and castrated female and male rats. These injections do not cause male or female rats to reproduce earlier.

Ovarian follicular hormone is not an entirely specific female hormone, for it reduces the weight of male rats in the same way as it reduces the weight of female rats. Therefore, the conclusion can be drawn that the follicular hormone does not necessarily have any antagonistic effect on the male sexual apparatus.

W. KERWIN.

Terada, M.: The Changes in the Ovaries and Other Organs of Animals Injected With Various Ovarian Substances. *Japan Medical World*, 1927, vii, 233.

Autolysates of corpus luteum, interstitial gland, and follicular fluid when injected intraperitoneally into white rats, produce an hyperemia and degeneration of the ovaries. The interstitial gland is the first to degenerate, and the follicles are second. The germinal epithelium, lutein cells, and the very young follicles are but slightly affected. A true cystic degeneration of the follicles was invariably produced. The follicular fluid invades the interstitial gland most markedly and this tissue shows the least resistance. The ovaries of very young animals are more resistant than are those of older and matured animals. These ovarian tissue autolysates also caused a certain amount of degeneration of the kidneys, probably on account of the toxic effect produced on the kidneys.

RALPH A. REIS.

Trivino, F. G.: Increased Uterine Development by Means of Serum From Pregnant Women. *Klinische Wochenschrift*, 1926, v, 2022.

The author injected serum from pregnant women into young, immature white mice. In 42 of the 43 thus injected, there was found, one week later, a marked hypertrophy and maturation of the uterus. Sections through the musculature

showed no changes, but the mucosa invariably showed a full adult development even though the mice used were very young. The uterine lumen had always reached adult size. On the other hand, carefully carried out control experiments, using serum from nonpregnant women, showed no such changes in uterine structure or development. This pregnancy serum proved to be thermostabile, soluble in alcohol, and was dialyzable.

On account of the large amount of this hormone present in the blood serum of all pregnant women, the author cannot concede that the ovaries alone could or do produce it. He is definitely of the opinion that both the placenta and the uterine wall contribute toward the production of this pregnancy hormone as well as the ovaries.

RALPH A. REIS.

Dohrn, M., Faure, W., Poll, H., and Blotevogel, W.: Tokoinine, Vegetable Substances With Activity Resembling Sex Hormones. *Medizinsche Klinik*, 1926, xxii, 1417.

Biologic observation shows that with increased knowledge the physiologic-chemical boundaries between animals and plants become less and less distinct. The authors have shown that substances having the action of sexual hormones are not limited to the sexual organs of animals. With vegetable substances they have produced in mice the typical epithelial changes in the vagina as described by Stockard and Papanicolaou. They derived their material from sugar beet root, potato bulbs, parsley roots, cherries, plums, and yeast. The raw extract is similar to the sex hormones obtained from the placenta or ovary, and is an oil. The authors found that this substance produced an increased growth of uteri in four days.

J. P. GREENHILL.

Smith, Margaret, G.: A Study of the Ovarian Follicular Hormone in the Blood of the Pregnant Woman. *Bulletin of Johns Hopkins Hospital*, 1927, xli, 62.

The concentration of a substance, identical in its biologic property with the ovarian follicular hormone, increases in the blood of pregnant women from the onset to the termination of pregnancy. It has always been found in the same concentration during and shortly before labor, and its concentration at this time is greater than that found at any other time.

There is an immediate rapid disappearance of this substance from the blood following delivery. It can be demonstrated in the urine before and following labor. The amount found in the placenta per gram of weight is approximately twice that found in the blood per cubic centimeter.

The concentration in the maternal blood during labor and in the blood from the cord is the same.

C. O. MALAND.

Hirsch, H.: Variations in the Female Sex Hormone Content in the Blood of Women. *Archiv für Gynäkologie*, 1928, cxxxi, 172.

The amount of female sex hormone in the blood of normal and healthy women increases during the normal intermenstrual period and reaches its peak the day before the menstrual flow begins. It decreases in amount gradually during the days of the menstrual flow. Menstrual blood contains from three to six times as much female sex hormone as does the circulating blood. There is a steady increase in the amount of this hormone during pregnancy up until delivery. In the days immediately following delivery it decreases rapidly until the twelfth day postpartum, at which time it can no longer be recovered from the blood.

RALPH A. REIS.

Dohrn, M., and Faure, W.: The Excretion of the Female Sex Hormone. *Klinische Wochenschrift*, 1927, vii, 943.

It is a well-established fact that the female sex hormone is excreted in the urine of adult males as well as adult females. The amount excreted in the urine of pregnant women is very large, namely, one thousand mouse units per liter. The authors found a comparatively tremendous excretion of the female sex hormone—thirty thousand mouse units per kilogram—in the dried feces of pregnant women.

RALPH A. REIS.

Zondek, B.: Female Sex Hormone in the Urine, Especially in Pregnant Women. *Archiv für Gynäkologie*, 1928, cxxx, 485.

The author describes his method of extracting the female sex hormone from the urine. The lipoids are first extracted from the urine without the use of alcohol. The residue is then alkalinized and heated, dissolved in water, and shaken up with ether. The latter is then removed and the new residue dissolved in distilled water or weak acetic acid solution and heated. This latter mixture is filtered, and the female sex hormone is contained in the filtrate which should be colorless, odorless, and clear.

RALPH A. REIS.

Zondek, B., and Aschheim, S.: Anterior Lobe of the Pituitary. *Archiv für Gynäkologie*, 1927, cxxx, 1.

The authors implanted various endocrine glands and injected different body fluids into castrated female mice but failed to establish estrus. They believe, therefore, that the ovarian hormone is produced only by the ovary, with the possible exception of the placenta. The feeding of human thymus does not inhibit ovulation, neither does the removal of both adrenal bodies. They were also unable to establish sexual function in immature female mice by feeding or transplanting pieces of the thyroid, thymus, pineal body, adrenals, testes, or posterior lobe of the pituitary. A transplant of the anterior lobe of hypophysis, either human or animal, however, produced estrus in from eighty to one hundred hours. The gland from a male subject was as effective as that of a female subject. This hormone or activating substance is still present in women who have passed the menopause. It appears to be the motor of the sexual function. It stimulates follicular function, ripens the follicles, and mobilizes the ovarian hormone. This latter has a specific action on uterus and vagina.

RALPH A. REIS.

Zondek, B., and Aschheim, S.: The Hormone of the Anterior Lobe of the Hypophysis. *Klinische Wochenschrift*, 1927, vi, 249.

From their experiments on mice, the authors find that ovarian function cannot be established by nonspecific stimulation, even if endocrine in origin, except by transplantation of the anterior lobe of the hypophysis. The posterior lobe is inactive in this respect. This hormone of the anterior lobe is the same in mice as in the human being. In human beings it is found in both men and women. It is thus established that one endocrine gland—the ovary—is dependent upon another endocrine gland—the anterior lobe of the hypophysis—for its stimulation and activity.

Sections of young and immature ovaries stimulated to an hyper-development and functional activity by means of anterior lobe transplants show a marked development of the follicular apparatus and of corpus luteum development.

They conclude from their extensive experiments that the anterior lobe of the hypophysis is the motor of the sexual functions and that the ovarian hormone

plays only a secondary rôle. The ovum plays only a very minor part, for roentgen destruction of the ova does not prevent hormone formation for many weeks. It stops completely only if sufficient radiation is used to prevent the anterior lobe hormone from stimulating the follicles to ovarian hormone formation.

RALPH A. REIS.

Aschheim, S.: *Hormone and Pregnancy*. Medizinische Klinik, 1926, xxii, 2023.

The author discusses his studies on the ovarian and hypophyseal hormones. During pregnancy the anterior lobe of the hypophysis is definitely enlarged, and this is essentially due to proliferation of the chief cells. The eosinophilic and basophilic cells retrogress. In the ovary the changes which take place during pregnancy are as follows: Maturation of follicles ceases. The corpus luteum persists until the end of pregnancy and is distinguishable from the corpus luteum of nonpregnant women by the absence of sudanophile lipoids, by the presence of colloid between the cells, and by the appearance of masses of calcium. The cortex of the ovary also shows changes during pregnancy. Many follicles become atretic which results in a marked increase and hypertrophy of the theca interna cells.

With Zondek the author has been able to isolate ovarian and anterior hypophyseal hormones. The test object for the ovarian hormone was the vaginal epithelium of the mouse, and the test object for the hormone from the anterior lobe of the hypophysis was the ovaries of infantile mice. The author found the ovarian hormone during pregnancy in the following organs: (1) the corpus luteum (in half the cases); (2) the cortex of the ovary (in one-third of the cases); (3) the placenta (always); (4) in the maternal blood from the end of the fourth month; (5) in the blood of the umbilical cord. The hormone was not found in the decidua or in the liquor amnii.

During pregnancy a substance identical with the hypophyseal hormone was found in the decidua, in the corpus luteum, in the placenta, in the maternal blood, especially after the fourth month, and in the blood of the umbilical cord.

The hormones of both the ovary and the anterior lobe of the hypophysis are so greatly increased during pregnancy that their presence in the maternal blood can be demonstrated by the injection of a small amount of serum. Both hormones stimulate growth. The ovarian hormone stimulates the genital tract while the hypophyseal hormone affects the entire body.

J. P. GREENHILL.

Zondek, B.: *The Hormone of the Ovary and the Anterior Lobe of the Hypophysis*. Medizinische Klinik, 1927, xxiii, 463.

The author, together with Aschheim, definitely proved that the changes in the vaginal epithelium and vaginal secretion are indicative of the activity of the ovarian hormone alone. Zondek found that the only source of the ovarian hormone is in the follicular apparatus of the ovary, that there is a cyclic production of hormone and that the quantity varies in this cycle. The hormone is produced by both theca and granulosa cells. He succeeded in separating the hormone from the lipoid with which it is bound and has prepared an aqueous solution of the hormone which is being marketed under the name of Folliculin. The latter produces the same results as follicle fluid. Furthermore, implantation of human corpora lutea produces the same effect as folliculin. By means of the latter many amenorrhoeic women were made to menstruate, but these were selected cases where ovarian dysfunction was thought to be the cause of the amenorrhoea. Folliculin has seemed to help not only the menstrual disorders but also secondary sex characters and sterility.

The ovarian hormone is produced only in the ovary, except in pregnancy when

it is formed also in the corpus luteum of pregnancy, in the atretic follicles which are rich in theca cells, in the blood, and perhaps also in the placenta.

The author's researches led him to the discovery of a new hormone. All kinds of substances and glands were tried in an effort to stimulate ovarian function and all but one failed. This exception was the anterior lobe of the hypophysis, for when this was implanted in an infantile mouse, the latter went into typical heat after ninety-six hours. The anterior lobe of the hypophysis, therefore, is the motor of the ovarian function. It does not matter whether the hypophysis is from a human being or from an animal, or from male or female. While it is true that both ovarian and hypophyseal hormones produce heat in animals, these hormones are by no means identical. The hypophyseal hormone is effective only when an animal has ovaries, because it produces its effect through the ovaries. It brings about a ripening of the follicle and ovum and the formation of a corpus luteum. The test object for the ovarian hormone is the vagina of a castrated mouse while the test object for the hypophyseal hormone is the vagina and, especially the ovaries, of a noncastrated, infantile mouse.

J. P. GREENHILL.

Aschheim, B., and Zondek, B.: Hormones of the Anterior Lobe of the Pituitary and of the Ovary in the Urine of Pregnant Women. *Klinische Wochenschrift*, 1927, vi, 1322.

The authors found one or more mouse units of ovarian hormone per cubic centimeter of urine excreted by pregnant women. This hormone appears in the urine during the fifth month of pregnancy and later in quantities sufficient to activate white female mice before maturity. The hormone of the anterior lobe of the pituitary is found in the urine much earlier, i.e., about five weeks after the last menstruation. The authors suggest a new method of early diagnosis of pregnancy by means of the finding of this hormone in the urine.

RALPH A. REIS.

Liebesny, P.: The Pituitary Gland and the Central Regulation of the Gonads. *Klinische Wochenschrift*, 1927, vi, 52.

Patients suffering from a primary insufficiency of the sexual glands all showed a lowered basal metabolic rate. When these patients were subjected to Doppler's "chemical sympathectomy" or to diathermy of the sexual glands and such treatments were successful, the basal metabolism improved. When the specific dynamic action of proteins was very low, together with a gonadal hypofunction, there was often improvement following careful and extensive diathermy of the pituitary region. It is probable, however, that this improvement was due to stimulation of the brain centers themselves rather than to stimulation of the pituitary gland.

RALPH A. REIS.

Aschheim, B., and Zondek, B.: Pregnancy Test. *Klinische Wochenschrift*, 1928, vii, 8.

The authors' test consists in injecting from one to two cubic centimeters of the morning urine from pregnant women into young female mice and noting the effect upon the ovaries. Castrated adult mice are used as controls. The authors have previously reported the finding of the female sex hormone in the urine of pregnant women, and such urine when injected into immature female mice stimulates the ovaries. In this series the test was used 78 times and was unquestionably positive in 76. A repeat test of the remaining two gave a positive reaction on one. By this method pregnancy can be diagnosed within five days after the first missed menstrual period.

In 236 controls, there was a weakly positive reaction in three cases of myxedema and acromegaly, in 20 per cent of the cases of genital carcinoma, and in 2 persons, 1 man and 1 woman, with neither an endocrine disturbance nor a malignancy.

RALPH A. REIS.

Frank, Robert T., and Goldberger, M.: Clinical Data Obtained With the Female Hormone Blood Test. *Journal of American Medical Association*, 1928, xc, 106.

This report is based on and represents the outgrowth of all of the work of Frank and his collaborators on the female sex hormone. He summarizes his investigations since 1917 and reports further observations on the presence and concentration of the female sex hormone in the circulating blood of the human female by means of the reaction which he published in detail in 1926. In a large number of tests he again is able to demonstrate that the female sex hormone concentration in the blood increases after ovulation up to the time of menstruation. With the onset of the flow the hormone disappears from the circulating blood. The hormone is found in great concentration in the menstrual as well as in the postpartum blood. It is found in the circulating blood from the twelfth to the fortieth week of gestation.

The blood of many women suffering from menstrual abnormalities was studied. Six cases of menorrhagias showed high hormone concentration in the blood preceding menstruation. Metrorrhagias (16 cases) could be divided into two groups, the one revealing the typical hormone concentration cycle, the other showing no hormone in the circulating blood at any time. Women with marked premenstrual tension (nervousness, unbalanced autonomic system, psychic changes) exhibited an excess of hormone in the blood.

A certain number of patients with amenorrhea showed absence of hormone, while in a few other patients the hormone appeared in four weekly intervals in demonstrable quantities. This latter group seems to carry a more favorable prognosis.

In 4 persons with absent vaginas the attempt was made to determine the sex with this test. In 3 of them repeatedly the female sex hormone could be demonstrated in the blood, and even the typical cyclic change in quantity.

Sterilities seemingly fall into two classes. In the one the typical hormone concentration cycle is evident, in the other ovarian function is distinctly depressed. The number of cases so far studied is too small to draw conclusions.

By this same test these investigators were able to determine the death of the fetus after the twelfth week. With termination of pregnancy the hormone disappears quickly from the circulating blood.

This article contains many valuable references to literature and a detailed description of the technic elaborated by Frank.

GROVER LIESE.

Dohrn, M.: Is the Allen Doisy Test Specific for the Female Sex Hormone? *Klinische Wochenschrift*, 1927, vi, 359.

The author made Allen Doisy tests with testicular extracts and obtained the same results as with ovarian extracts, i.e., a definite cornification of the vaginal epithelium. He, therefore, cannot agree with Allen and Doisy, or Stockard and others who believe the test to be specific.

RALPH A. REIS.

Laqueur, E. et al.: The Presence of the Female Sex Hormone in the Urine of Men. *Klinische Wochenschrift*, 1927, vi, 1859.

The authors review their previous work with the female sex hormone and report here the fact that the identical hormone, as to composition and action, can be

recovered from the urine of sexually potent and healthy men. There is still a question as to the structure of these hormones but certainly their function is identical in producing estrus in the rat and in producing uterine overgrowth in immature rats. The hormone is found in comparatively large quantities in the urine.

RALPH A. REIS.

Schenk: Changes in the Hypophysis of the Rat After Operative and X-ray Castration. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1927, xci, 483.

During pregnancy in human beings and most suckling animals an enlargement of the anterior lobe of the hypophysis takes place. At the same time acromegalic changes occur, accompanied by enlargement of some joints, especially those of the spine. The majority of investigators say that the enlargement of the gland is due to an increase in the number of the eosinophilic cells; some that it is due to an increase in size and number of chromaffin cells, and others to basophilic cells. The enlargement has been confirmed by so many that there can be no question of it.

Most investigators find an enlargement as well after castration. Tandler x-rayed eunuchs and showed an enlarged cella turcica. Zacherl described a vacuolated cell having a large, vesicular central nucleus which Biedl considered to be the end stage in the development of the eosinophilic cell. Addison and Nukariya found large basophilic cells which the latter thought were not formed from eosinophiles. The same change was found whether the castration was done before or after sexual maturity.

The author repeated these experiments on rabbits, cats, and rats by castrating some and treating the testicles of others by x-ray. He found new cells in the hypophysis which he called castration cells. They were large, had distinct edges, stained weakly and, as they grew older, showed a vacuolated appearance with the nucleus excentrically placed, so that they finally appeared like signet rings.

These same changes took place in the hypophyses of the animals treated with x-ray but at a slower rate.

It can be said in the light of these and earlier experiments that there is a relationship between the sexual glands and the hypophysis, as shown by the examination of the hypophysis in pregnancy in human beings and also in lower mammals.

Changes in the hypophysis after castration are not found as generally and typically as one would think from the literature on the subject. Also the changes that do take place are in another direction than most authors think. The changes are characteristic in the rat but not so in the rabbit and were not constantly found in the cat.

FRANK A. PEMBERTON.

Aschheim, S., and Zondek, B.: Ovum and Hormone. *Klinische Wochenschrift*, 1927, vi, 1321.

The authors destroyed the process of ovulation in white mice by means of roentgen rays. Normal estrus followed, so that the ovum cannot be the origin of the ovarian hormone. Injections of this ovarian hormone into young and immature white mice produced estrus without any maturation of the graafian follicles. The ovarian hormone, therefore, does not influence the process of ovulation. Estrus appears in such animals in one hundred hours or less, if extracts of the anterior lobe of the pituitary gland are injected. The authors conclude that the ovum, ovulation, and the ovarian hormone are all dominated or controlled by the hormone of the anterior lobe of the pituitary gland.

RALPH A. REIS.

Westman, A.: *The Primacy of the Egg Cell*. Acta Obstetrica et Gynecologica Scandinavica, 1928, viii, 166.

The author performed bilateral salpingectomy on rabbits about twenty-four hours after coitus, when all the ova were situated in the tubes on their transit to the uterus. By doing this he eliminated all influence on the animals that could be excited by the ova cast off at the time of follicular rupture. In spite of these operations, the corpora lutea as well as the uterine endometrium passed through exactly the same cyclical changes as those found in pseudopregnancy. The experiments indicate that the development and function of the corpus luteum are not dependent upon products of absorption from ova liberated from the follicles.

J. P. GREENHILL.

Ancel, P., and Bouin, P.: *Concerning the Biologic Action of the Corpus Luteum*. Gynécologie et Obstétrique, 1926, xiii, 401.

The authors disagree with Schickele's hypothesis that it is the follicle which conditions the modifications of the uterine mucosa in the preparation for nidation and that the corpus luteum only prolongs this state. The authors studied these changes in the rabbit and conclude that all the structural transformations which are manifest in the uterine cornua present a constant chronologic relation with the evolution of the corpus luteum. These same structural transformations are strictly identical with those which occur in the uterus of fecund females and precede the fixation of the ovum. There exists between the ovarian and uterine changes, not only a constant chronologic relation but a relation of cause and effect. If one destroys the corpus luteum following coitus with the fine point of a galvanic cautery, the process is interrupted immediately, and the mucosa returns to its normal reposing state. This does not occur if the ovary is similarly injured elsewhere. It is not the follicle which determines these changes, because at the time at which the follicle is at the height of activity proliferation of the mucosa never takes place before the formation of the corpus luteum. To suppose that the corpus luteum does not determine this preparation but merely assumes a "protective rôle" is to deny the strict determinism of biologic phenomenon. Schickele's chief postulate is based on the fact that ovulation may occur as late as the twenty-third or twenty-fourth day of the menstrual cycle, and yet the endometrium be apparently at the height of its development as evidenced by the normal sequence of menstruation. Under such conditions, according to Schickele, it is only the follicular apparatus which could have determined the hyperplasia of the mucosa, for the corpus luteum could not have been sufficiently formed to incite the changes of hemorrhage, exfoliation, etc. The authors point out that in the normal course of events as soon as the follicle is ruptured, the corpus luteum forms and the uterus undergoes the characteristic preparation. This preparation requires, to become complete, the time which is indispensable to the ovum to arrive at its place of fixation. The endometrial slough in such an event comes not at the period of maximum development of the mucosa but before, and is merely an abnormality, and the function of a non-physiologic course of events. In other words, under certain abnormal or pathologic conditions, the uterus is able to react by a bloody discharge due to corpus luteum action before the complete preparation of the mucosa for nidation.

GOODRICH C. SCHAUFLER.

Uhlmann, F.: *Is there a Hormonal Influence on Sex?* Medizinische Klinik, 1928, xxiv, 1055.

The old belief was that sex is determined at the very latest when fertilization takes place and that the sex cannot be affected after fertilization has taken place.

If this belief is accepted, some facts are hard to explain. For example, among amphibians and lower animals the sex of the embryos may be affected by changing the temperature of the environment. The author reasons that if the sexual organs of fully mature animals can be affected by the sex hormones, it should be simple to influence the sex of a developing fetus. He, therefore, injected ovarian hormone into rabbits and then permitted them to mate. He found that the sex was affected in utero, for the offspring showed an overwhelming number of females. Fellner obtained the same results.

J. P. GREENHILL.

Heyn, A.: The Influence of Ovarian Function on the Basal Metabolism. *Archiv für Gynäkologie*, 1927, cxxix, 760.

The author studied the basal metabolism in 100 women and found that the normal menstrual cycle in healthy women has no effect upon metabolism. Dysmenorrhea likewise produces no changes. Severe ovarian insufficiency (primary amenorrhea) shows a decrease of more than 10 per cent in the metabolic rate. There is an increase of more than 10 per cent in about one quarter of the patients suffering from hemorrhagic metropathies and an increase of from 10 to 20 per cent in about one-half of the patients suffering from myomas. Castration produces a temporary decrease in the metabolic rate for from about three to six months in about one-half of the patients but in nine months the metabolic rate is again normal.

The results during and following normal menopause vary from 10 plus to 10 minus, and are inconclusive. The administration of ovarian extracts to menopausal patients, showing a decreased metabolic rate, invariably increases the rate to normal but never increases the rate above normal. The ovaries, therefore, have no direct effect upon metabolism but only a slight and secondary effect indirectly by virtue of the effect which the ovaries exert upon the thyroid. Amenorrhea is not the effect of ovarian insufficiency but rather of the insufficiency of the entire endocrine system.

RALPH A. REIS.

Schultze, G. K. F.: Ovarian Function, Potassium and Calcium Ion-Concentration of the Blood Serum and the Vegetative System. *Archiv für Gynäkologie*, 1925, cxxvi, 35.

Schultze finds a definite relationship between ovarian function and the potassium-calcium concentration in the blood serum, which suggests some influence of the corpus luteum on the vegetative or sympathetic nervous system. When there is a deficiency of corpus luteum stimulation, there is an overstimulation and predominance of vagus tonus. In some of these patients the potassium was as low as 14 milligrams per 100 c.c., although the calcium content was seldom increased. The author believes that this lowered concentration in the blood serum speaks for an increased concentration in the tissues.

RALPH A. REIS.

Vogt, E.: Insulin and Ovarian Function. *Zentralblatt für Gynäkologie*, 1927, li, 719.

Summarizing the results of his experiments the writer states that insulin has various effects upon organs, organ-systems, and metabolism. In the diabetic patient it influences the carbohydrate metabolism. Undoubtedly this is its essential effect. In the nondiabetic individual it can influence metabolism, in general causing obesity, or the endocrine system.

Insulin also has an effect on the internal secretion of the ovaries during menstruation and changes the irritability of the vegetative nervous system, which depends largely upon the calcium-contents of the blood. It reduces menstrual hyperglycemia as well as amount and duration of the flow. Hemorrhages due to a dysfunction of the ovaries, especially those of puberty and climacterium, are favorably influenced with insulin. Two injections of from 20 to 30 units daily before noon and evening meal, over a period of three or four days, are sufficient to obtain a beneficial effect.

GROVER LIESE.

Vogt, E.: Hormonal Sterilization of Female Animals With Insulin. *Medizinische Klinik*, 1927, xxiii, 557.

For purposes of sterilization there are three procedures: namely, operation, radiation, and hormonal therapy. Operation and radiation have certain disadvantages, and sterilization by means of hormones is still in the experimental stage. A number of individuals have produced sterility by means of the injection of sperm. Others accomplished this end by transplanting ovaries from gravid animals, by injecting ovarian extracts from pregnant animals, and by means of placental extracts. Likewise extracts from the corpora lutea of pregnant and nonpregnant cows produced sterility in rats. Vogt made rabbits sterile by injecting insulin. This is additional proof of the close relationship between the pancreas and the ovaries. Hormonal sterilization, according to the author, is the ideal method, because it is simple, certain, and safe.

J. P. GREENHILL.

Vogt, E.: The Dependence of Insulin Effect on the Ovary. *Deutsche medizinische Wochenschrift*, 1928, liv, 701.

Interrelation of the various hormones is discussed in the particular case of insulin to ovary. The author had previously used insulin in the treatment of uterine hemorrhages and for increasing the weight of patients in a subnormal state of nutrition. On these occasions he found that the effect of insulin on the same patient was quantitatively varying according to the period of the menstrual cycle. Experiments were carried out on healthy women, who were injected with a constant dose of insulin shortly before menstruation, and in the first and second part of the intermenstruum. The fasting blood sugar before and after the injection was determined and compared. In 50 women a regular change in the insulin reaction was found. Insulin was most effective immediately before menstruation. Its efficiency was decreased after the menstruation and increased again beginning with the middle of the intermenstrual period.

The same experiment on 60 pregnant women showed the effect of insulin considerably more constant, especially during the second half of pregnancy. This seemingly further supports the author's assumption, since the follicular cycle of the ovary is arrested during pregnancy. Other experiments were made with insulin activated with serum obtained from women in the different stages of the menstrual cycle. The results confirmed the previous findings: serum taken from women immediately before menstruation activated insulin most markedly; serum from women castrated by x-ray or operation, was the least effective.

GRUENTELD.

Haberlandt, L.: Hormonal Sterilization of Female Animals. Zentralblatt fuer Gynakologie, 1927, li, 1418.

Since 1919 Haberlandt is experimenting on the problem of producing temporary sterility in female animals. Subcutaneous transplantation of ovaries from pregnant rabbits and guinea pigs into nonpregnant animals produced temporary sterility in these. The effect is thought to be brought on by the formation of a hormone in the transplanted corpus luteum, which inhibits follicle maturation. After resorption of the transplanted ovaries the animals became pregnant and gave birth to mature, normally developed, living young. Sterility could be attained for 2 to 3 months.

Identical results were obtained by Haberlandt with the daily subcutaneous injections of certain ovarian and placental extracts on the market. The former preparation is extracted out of the ovaries of pregnant cows according to a method of Abderhalden, the latter out of placental tissue. Microscopic examinations of the ovaries after treatment showed a complete absence of large, matured follicles.

While Haberlandt is convinced of a hormonal action in securing temporary sterility in these animals, Koehler assumes a simple protein reaction. In support of his theory Haberlandt in further experiments brings evidence that temporary or permanent sterility can be brought about in the white mouse by feeding either of the above mentioned preparations daily in milk for a few months.

GROVER LIESE.

Haberlandt, L.: Hormonal Sterilization of Female Animals by Means of Insulin. Medizinische Klinik, 1927, xxiii, 1024.

Vogt recently reported that he obtained hormonal sterilization in rabbits by means of injections of insulin and because of this he considers the pancreatic hormone and the ovarian hormone as antagonists. This is incorrect. In the first place there is not one ovarian hormone but at least two, a stimulative hormone and an inhibitory one. The first one which is known as the female sex hormone can activate even the ovaries of senile animals. Vogt has failed to show that in the animals sterilized by means of insulin, maturation of follicles was inhibited, as Haberlandt accomplished by injecting ovarian preparations from pregnant cows. Furthermore, the authors who sterilized animals by injecting spermotoxic antibodies achieved this not by means of hormonal sterilization but by humoral or immunization—sterilization. The first true hormonal sterilization experiments on female animals were performed by the writer by means of transplanting ovaries from pregnant animals into nonpregnant animals. There is no practical value in Vogt's experiments because the amount of insulin necessary to sterilize animals was too large. Furthermore Haberlandt has been able to produce in animals the same effect by the oral administration of physiologic inhibitory substances. The later offspring of animals which had been temporarily sterilized is not abnormal in any way.

J. P. GREENHILL.

Castro, Rocco: Biologic Sterilization of the Female With Injections of Seminal Fluid. Archivio di Ostetricia e Ginecologia, 1926, p. 558.

Several investigators have found that the subcutaneous injections of seminal fluid in the female produces temporary sterility of one to three months. Experiments have been carried out in the dog, rabbit and the rat. These show that a temporary sterility is produced and that if too many injections are given there is marked loss of weight representing a "protein cachexia." It is not known whether the sterility is due to a protein reaction or to a specific immunizing action.

J. W. PIERCE.

Reiprich, W.: The Incretory Influence of Male Sex Glands on Conception and Pregnancy. *Medizinische Klinik*, 1928, xxiv, 728.

The author performed a series of experiments on rabbits. He first transplanted testicles into adult females and he found that a temporary sterility resulted even in cases where the females accepted the males. He then experimented with both rabbits and white mice to see the effect of testicular implants on pregnancy and found that after transplantation all the pregnancies not only ceased to progress but the ova were absorbed. The larger the testicular transplant, the quicker was there retrogression of the gestation. This effect on pregnancy began about 8 to 10 days after the transplant was made, as proved by laparotomy. Implantation of nonspecific tissue such as muscle had no effect at all on conception and pregnancy.

The effect of the testicular transplants was not a permanent one because in some cases as soon as the transplants degenerated, conception and pregnancy took place. In three cases, laparotomy performed two months after testicular transplantation showed the uterus and ovaries greatly atrophied, but seven months later the organs were of normal size again. Some other experimenters have shown that when a male and female animal are united symbiotically, and the female is mated to another male, the female proves sterile. Others have produced sterility by injection of sperm and still others by the transplantation of ovaries of pregnant animals and also by means of placental and ovarian hormone. The question is raised whether in human beings pregnancy can be interrupted by testicular hormone.

J. P. GREENHILL.

Sippel, P.: Transplantation Material in Homoplastic Ovarian Transplantation. *Klinische Wochenschrift*, 1926, v, 269.

The most important detail in homoplastic ovarian transplantation is the careful selection of material. Sippel suggests that blood compatibility tests should be made between the donor and the recipient before any transplantation is attempted. The author uses for transplantation purposes, ovaries removed with ectopic pregnancies, early carcinomas, multiple myomas or those removed on account of some systemic disease, such as cardiac diseases, or even early cases of apical involvement of the lung. He has also used ovaries, when well developed, from patients with complete vaginal or uterine aplasia. Each ovary, before being transplanted, is sectioned and examined microscopically and only ovaries which show ripening follicles and corpora lutea and give the impression of being generally healthy are used.

The author cannot agree with Hollauer that there is any danger in using ovaries from patients who are suffering from early carcinoma or early pulmonary tuberculosis. Both these conditions, if present, can be readily identified in the ovary, both macroscopically and microscopically. The author has transplanted ovaries from 36 patients with early carcinoma without any after-effects.

The ovary to be transplanted is always kept at body temperature until used, although several times the technic of Zondek was employed, i.e., the ovary was kept on ice for from twenty-four to seventy-two hours. The author has not as yet arrived at the definite conclusion that this latter method gives as good results as the former one. It would, of course, simplify the method greatly if the results obtained by using ovaries preserved on ice for several days equalled those obtained by transplanting after a short interval during which the ovary is kept at body temperature.

The author reports a series of 127 cases of this type of ovarian transplant. The transplantation is usually done into or just under the rectus sheath. There have been no complications or after-effects other than six superficial wound infections.

RALPH A. REIS.

Lipschuetz, A.: Further Investigation on Transplantation of Artificially Preserved Ovaries. *Deutsche medizinische Wochenschrift*, 1928, liv, 701.

The author was able to demonstrate the hormonal effect of transplanted ovaries which after removal had been kept on ice for from three to sixteen days.

The experiments were carried out as homologous transplants on the guinea pig. The organ was transferred to the kidney of a castrated male and effect on the mammary glands was observed. A feminizing effect could be discovered, lasting one hundred and sixty days without decrease, obtained with an ovary kept in cold storage for three days. The ovary after a storage of sixteen days showed the same effect for at least several weeks. Microscopic examination revealed that the development of follicles was still going on in the slices of the transplanted ovary.

Cooling the ovary to 0° C. will destroy it. The temperature on ice remains between 1 and 3° C.

GRUENFELD.

Fawcett, Hadfield, and Phillips: Suprarenal Virilism. *The Bristol Medical-Chirurgical Journal*, 1926, xliii, 20.

A woman, aged seventy, was admitted to hospital for intestinal obstruction. A large tumor mass was found replacing each suprarenal gland, representing a cortical hyperplasia with diffuse fatty infiltration. The stroma was probably sarcomatous. Secondary sex characters of the patient approximated to the male type, the voice, physique, and hirsuties being masculine. Considerable hypertrophy of the clitoris was present. The uterus, ovaries, and vagina were rudimentary. No tissue resembling the male testicle was found in the pelvis.

ADAIR AND CARLSON.

Vignes, H.: The Use of Testicular Preparations in Gynecologic Ailments. *Bulletin Général de Thérapeutique*, May, 1926.

There is evidence to show that there exists a certain antagonism between the testicles and the ovaries. This evidence rests upon the following facts: (1) parabiotic experiments; (2) the condition known as free-martinism; (3) changes in sex after castration in certain animals; (4) it is difficult to graft successfully an ovary in a normal male and vice versa; (5) if an animal is first castrated, a graft of the opposite gonad will be successful.

Experimentally the injection of testicular extract or of sperm into females may occasionally cause the appearance of male characteristics or it may produce sterility.

Vignes had preparations of testicular extract made and used them for gynecologic ailments. The indications for the use of these extracts were: (1) senility, attributable to the menopause; (2) insufficient menses; (3) superabundant menses (to counterbalance the overactivity of the ovaries); (4) nervous trouble attributable to the genital function, and (5) ailments produced by continence. The results obtained by the author were not at all striking, but he intends to continue this study if the occasion again arises.

J. P. GREENHILL.

Uhlmann, Fr.: Standardization of the Ovarian Hormone. *Le Gynécologie*, 1927, xxvi, 65.

Both in the experiment and in certain clinical observations a variety of phenomena can be produced with the administration of various ovarian extracts. Naturally the question arises whether they all are due to a single active substance or whether the ovary elaborates several hormones, differing in their specific effect. The writer believes that two hormones are produced.

He employed in a large series of experiments two preparations, the one supposed to contain solely the lipoid extract of ovary, follicle and placenta, the other claimed to represent another water-soluble hormone. His main object is to find a reliable method of standardization for these two hormones which, as he endeavors to show, are clearly differentiated by their biologic effect. The lipoid extract stimulates growth of uterus, tubes, vagina, vulva and breasts; influences sexual activity as expressed in rut, and inhibits menstruation according to certain clinical reports which he seemingly accepts as conclusive. The water-soluble hormone, on the other hand, will cause hyperemia of the sexual organs, stimulate and even precipitate menstruation (according to clinical reports), and increases milk secretion.

He concludes that the lipoid extract, qualitatively and quantitatively, is best standardized on the basis of its growth effect, and only less reliably by the now generally employed Allen-Doisy method.

In contradistinction to the lipoid extract, the aqueous extract possesses characteristic pharmacologic properties. Most important among them are the effect on intestinal peristalsis and on salivary secretion. This latter effect, in his belief, represents the best and simplest method of standardization of this second water-soluble hormone.

The American Journal of Obstetrics and Gynecology

VOL. XVII

ST. LOUIS, FEBRUARY, 1929

No. 2

Original Communications

THE RELATION OF ECTOPIC GESTATION TO THE ASSOCIATED UTERINE CHANGES AND VAGINAL BLEEDING*

BY SAMUEL H. GEIST, M.D., F.A.C.S., AND MORRIS R. MATUS, M.D.
NEW YORK, N. Y.

(From the Gynecological Department and Laboratories, Mount Sinai Hospital)

SAMPSON¹ in 1914 pointed out the influence exerted by ectopic pregnancy on the uterus, especially its effect on the uterine blood supply, and its relation to uterine bleeding. He studied a series of cases of ectopic pregnancy in which the uterus had been operatively removed and concluded that the termination of ectopic pregnancy rarely is complete at the time the patient is operated upon. He thought that as long as it is incomplete, pain and bleeding continue, the incompleteness of the ectopic gravidity causing a subinvolution of the uterus similar to that due to an incomplete intrauterine abortion. The uterine bleeding, he demonstrated by his injection method, to be venous in origin and to arise from the endometrium. He did not believe that there was any escape of blood from the tube into the uterine cavity. Venous spaces, especially in the compacta at its junction with the spongy layer, are commonly thrombosed or ruptured and it is at this level that the separation which gives rise to the decidual cast takes place. Occasionally superficial venous spaces may rupture and cause subepithelial extravasations of blood which break through the mucosa into the uterine cavity. When this type of lesion predominates, no decidual cast is expelled. Sometimes the entire compact layer is destroyed in small fragments. The uterine mucosa as the end-result of this regressive and destructive stage is a thin endome-

*Received for publication, June 6, 1928.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

trium with few glands and a surface covered by cuboidal epithelium. This is the type of mucosa so commonly obtained by curettage in cases that have been bleeding for a long period. Sampson also believed that as long as active villi are present this subinvolution persists.

Polak and Welton² also made a study of the changes in the uterus associated with ectopic gravidity. They believed that the pain was due to tubal and uterine contractions which resulted in a separation of the uterine and tubal decidua. The clinical evidence of these contractions is bleeding from the endometrium and extrusion of portions of the decidua. As long as the embryo remains alive and its development is in progress, uterine bleeding does not occur. When it does occur following the destruction of the embryo, it may continue for a considerable period of time, due to the fact that the chorionic villi remain alive and exert an influence on the uterus. They mention the possibility of blood escaping through the uterine end of the tubes into the uterus when the pregnancy is close to the horn. They also believe that 50 per cent of the cases pass a decidual cast either "en masse" or piecemeal.

In the tube, decidual reaction was found often far remote from the seat of implantation. Coincident with the separation of the ovum, there may be bleeding from these decidual areas in the tubes as well as in the uterus.

Polak and Wolfe³ investigated the persistence of vaginal bleeding following the removal of the gestation sac. In twenty cases, post-operative uterine bleeding persisted for periods varying from a week to fifteen days following the removal of the tube. In five of these cases the uterine cavity was subsequently curetted. They concluded from the study of these curettings that the persistent bleeding is due to the fact that in the uterus, islands of decidua remain which are cast off at subsequent times, this desquamation being associated with hemorrhage. In some few cases where the bleeding persisted, no decidua was found, only a hemorrhagic interval mucosa. The persistence of bleeding in these cases they ascribed to a delayed involution. Polak, Novak and Wolfe quote cases in which a curettage revealed decidua but in which, with the continuance of the extrauterine gravidity, a new decidua was formed.

Novak and Darner⁴ studied twenty-one cases of tubal pregnancy in which uterine mucosa was available. They believe that uterine casts are expelled in about 50 per cent of the cases of tubal pregnancy and feel that in not a few cases, intrauterine degenerative changes may cause a disintegration of the mucosa so that it may be expelled in small particles and thus escape detection. They believe that the thrombosis in the sinuses at the junction of the compacta and spongiosa brings about the separation of the superficial layer. They con-

clude that the life of the uterine decidua is closely associated with the viability of the impregnated ovum and that as long as the embryo is alive, the decidua remains intact. With the death of the embryo begins the degenerative change. They point out that even though the fetal death is responsible for the separation of decidua, the sequence is not always an immediate one. The presence of trophoblastic activity after the death of the fetus would help to explain the persistence of bleeding in many cases of extrauterine pregnancy. Novak emphasizes that curettage done for diagnostic purposes is usually performed because of the persistent bleeding and that the most common finding at this period is a postmenstrual or interval type of mucosa. He concludes that little information can be obtained by this procedure. In 21 of his cases, 11 showed postmenstrual or interval type of mucosa. In 7 there was a definite decidua but in these 7 cases, amenorrhea had been present and so curettage as a purely diagnostic measure would have been contraindicated.

Lewers⁵ mentions that persistent amenorrhea is especially characteristic of the cornual type of extrauterine pregnancy. While many cases of ectopic pregnancy which progress to term are associated with amenorrhea, there are many reported in which bleeding was noted sometime in the course of the pregnancy.

Beaucamp⁶ reports a case of secondary abdominal pregnancy going to term with a living fetus in which there had been bleeding at various times during the course of the gravidity, and mentions similar cases reported in the literature.

Summarizing the literature above quoted, these facts seem to be commonly accepted:

1. That vaginal bleeding is uterine in origin, is of venous character and takes place with the death of the fetus.
2. That bleeding may continue for a considerable period of time, possibly due to the presence of viable chorionic villi in the tube.
3. That following the death of the fetus, the decidua is expelled as a cast, or in small fragments after the lapse of a variable interval.
4. In a considerable percentage of cases, believed by some authorities to be as high as 50 per cent, a decidual cast is expelled either as a large fragment or in disintegrated pieces.
5. That curettage gives little information because when done for prolonged bleeding, as is commonly the indication, the mucous membrane is of a resting type.
6. There is, however, evidence that in spite of bleeding during extrauterine gravidity, the pregnancy may develop to term with a living baby. This fact would indicate that uterine bleeding may occur without producing death of the fetus.

We desire to report 39 cases in which laparotomy was performed,

and where the character of the endometrium could be determined. In this group there were 6 hysterectomies, 5 of which were performed because of coincidental chronic inflammatory disease. The sixth case was one of secondary abdominal pregnancy. The uterine mucosae in the other 33 cases were made available by obtaining 8 uterine casts, 23 curettages, 1 abdominal hysterotomy and 1 uterus at autopsy. The curettages were either performed from twenty-four to forty-eight hours before laparotomy or at various periods subsequent thereto.

The purpose of the investigation was to correlate the findings in the tube and uterus with the clinical symptoms, especially with vaginal bleeding, and thus to substantiate the findings of previous writers as to the cause and origin of bleeding in ectopic pregnancy.

It is well established that a gravidity, whether intra- or extra-uterine, stimulates a typical decidual reaction in the uterus. When the pregnancy occurs outside the uterus, the decidua that is formed at the site of implantation is usually less marked and less extensive than that responding to the influence of intrauterine gravidity. Study of the decidual formation in the tube in cases of tubal pregnancy has shown that the reaction is inconstant in its occurrence and when present it is usually patchy in its distribution.

It is generally believed that the disturbance of the integrity of an ectopic pregnancy induces changes in the uterus which cause degeneration and casting off of a decidua with accompanying bleeding. These disturbances may be:

1. The disappearance of the chorionic villi with no evidence of fetus in the tube.
2. A living fetus or a recently dead one, with viable chorionic villi.
3. Gradations between these two extremes.

An analysis of our 39 cases is shown in Tables I, II, and III, bearing in mind the purpose of the investigations; namely, the association of bleeding with the persistence of decidual tissue in the uterus, and the existence of the living fetus and of living chorionic tissue.

CASES SHOWING SPOTTING AND UTERINE DECIDUA

In our series of 39 cases, 23 showed uterine decidua, a larger portion than those previously reported. Eight of the 39 cases, nearly 20 per cent, passed decidual casts that were easily recognizable. What percentage would have passed casts, if they had not been curetted or had not had hysterectomies performed, or if they had been more observant as to the vaginal discharge, cannot be determined.

The question naturally arises as to whether this decidua disappears immediately with the death of the pregnancy in the tube or if it does persist, for how long does it survive and what causes it to survive? It is generally believed that disturbances of the tubal pregnancy in-

duce changes in the uterus which result in degeneration and casting off of the decidua with accompanying vaginal bleeding. This disturbance may be complete death of the ovum (both fetus and chorionic villi), a damaged fetus with viable chorion or any gradations between those two extremes. The variations between these two extremes may

TABLE I. NO EXTERNAL BLEEDING. 3 CASES

CASE NO.	TUBAL FINDINGS	UTERINE FINDINGS
XIX	Ruptured Degenerated villi Langhans cells	Definite decidua
XXX	Ruptured Viable villi	" "
XXXVI	3 months embryo Ruptured	" "

be the explanation of the variability of the findings in the uterus and tubes. It has been shown that long after the apparent death of the ovum, the chorionic epithelium may continue to survive.

Of 16 cases of typical tubal rupture, 11 showed true decidua in the

TABLE II. SPOTTING. 10 CASES

CASE NO.	TUBAL FINDINGS	UTERINE FINDINGS
IX	Spotted for one day, then one week later again spotted for one day	Well preserved syncytium Decidua
XI	Spotted for two weeks	Few old degenerated chorionic villi and decidua Decidua
XIII	Spotted for 6 weeks	Fetus and decidua Decidua
XXII	Spotted for 4 weeks	10 weeks fetus in tube Decidual cast expelled two days after operation
XXVI	Spotted for 18 days	Synecytium and tubal decidua No decidua. Resting glands
XXV	Slight bleeding from vagina after examination by doctor 5 days ago. Spotted 3 days ago; first pain 5 days ago and again day of admission	Well preserved Langhans and syncytial cells Decidua and pregnancy glands
XXXI	Spotted for 3 days, 1½ month before final attack of pain indicated rupture	Fetal sac. Viable villi Cast expelled 3 days after operation
II	Spotted for 2 weeks before admission	Secondary abdominal pregnancy. Fetus living Decidua and pregnancy glands
XXIII	Spotted for one week, one week ago	Mass syncytial cells Three months size. Typical decidua and pregnancy glands
XXXVIII	Spotted for 10 days	Chorion and decidua Decidua

TABLE III. BLEEDING, EXTERNAL. 26 CASES

CASE NO.		TUBAL FINDINGS	UTERINE FINDINGS
I	Spotted for 1 week, then bled for 2½ weeks. Total 3½ weeks	Well preserved chorion decidua	Negative
III	Spotted 1 month with periods of 2 to 3 days of actual bleeding	Degenerated chorion and some syncytial cells	Negative
IV	Spotted for 8 days and bleeding 2 weeks	Well preserved syncytium. No decidua	Negative
V	Bled for 2 weeks	Degenerated chorionic villi. No decidua	Negative
VI	Bled profusely for 2 weeks	Perfect 8 weeks fetus	Negative
VII	Spotted 6 days. Profuse bleeding with clots for 3 days	Few degenerated chorionic villi	Negative
X	Bled for 6 days	Degenerated chorionic villi	Negative
XVIII	Irregular bleeding for 3 weeks	Degenerated chorionic villi and decidua	Negative
VIII	Bled profusely for 7 days	Few necrotic chorionic villi	Edema and changes suggesting old decidua. Glands, some gravidity type
XII	Bled for 12 days. Discharged fragments of tissue	Few syncytial giant cells	Necrotic decidua. No pregnancy glands
XIV	Bled moderately for 4 weeks. Expelled some clots	Viable chorionic villi and decidua	Typical decidua and pregnancy glands
XV	Bled since night before laparotomy (4 days ago)	Well preserved chorionic tissue	Typical decidua and pregnancy glands
XVI	Bled profusely for 2 weeks	Degenerated chorionic villi and decidua	Typical decidua cast expelled 3 days after operation
XVII	Bled for 2 weeks. Expelled large number of clots	Not examined. Reported ruptured	Decidua and pregnancy glands
XX	Bled for 2 weeks	Well preserved islands of Langhans cells	Cast expelled one day before operation
XXI	Bled for 6 weeks	Necrotic chorionic villi and decidua	Negative
XXIV	Bled for 3 weeks	Degenerated chorion	Typical cast expelled 25 days before laparotomy
XXVII	Bled profusely for one month	Degenerated chorion	Negative

TABLE III.—CONT'D

CASE NO.		TUBAL FINDINGS	UTERINE FINDINGS
XXVIII	Bled for 2 weeks	Well preserved syncytial and Langhans cells	Negative
XXIX	Spotted for 10 days, then profuse bleeding for 5 days	Degenerated chorionic villi	Typical decidua and pregnancy glands
XXXII	Bled for 5 weeks	Well preserved Langhans cells	Negative
XXXIII	Bled irregularly one week	Syncytial masses in vessel walls	Cast expelled the day of operation
XXIV	Bled for 3 weeks	Reported ruptured; not examined	Typical decidua and pregnancy glands
XXXV	Bled for 24 days	Necrotic villi	Negative
XXXVII	Bleeding period not determined	Many degenerated chorionic villi, many well preserved villi	Negative
XXXIX	Bleeding 3 weeks	Degenerated villi; some well preserved	Negative

SUMMARY

3 Cases	No bleeding at all	3 definite decidua in uterus
10 Cases	Spotting	9 definite decidua in uterus
26 Cases	Bleeding	15 showed no decidua or pregnancy glands in uterus
		11 showed decidua and pregnancy glands in uterus

uterus. Of these 11 cases, 2 presented no external bleeding. In 1 of the 2 cases, a living three months' embryo was found, while in the second, no embryo but some viable chorionic villi were present. Of the 11 cases, 7 gave a history of spotting of from one to forty-eight days (Figs. 1 and 2), and of these 7 cases, 2 presented a living eight weeks' fetus. In another case where the spotting was of forty-eight days' duration, the tubes and clots showed no evidence of fetus or villi but masses of syncytium. In the other 4 cases no fetus was found but viable villi were present.

Of the 15 cases of tubal abortion, 4 showed definite intrauterine decidua and one an atypical decidua. In the cornual pregnancy there was likewise a typical decidua. In another case in which the actual condition of the tubes was not described other than as an ectopic pregnancy, there was atypical decidua.

Apparently the bleeding does not necessitate the expulsion of a cast nor does death of the fetus entirely control this. In those instances where no fetus was found, viable villi were always present



Fig. 1.—Showing typical decidua and glands of pregnancy in a case of tubal rupture. History of spotting for one week.

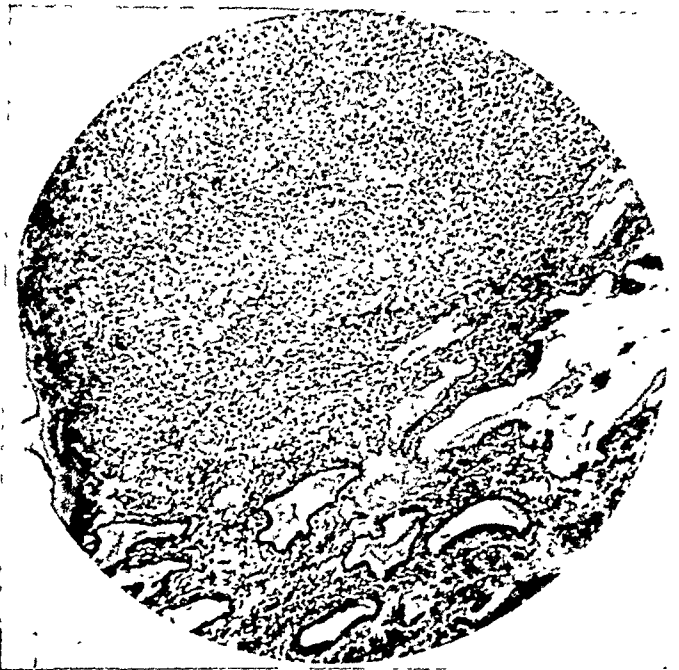


Fig. 2.—Typical decidua in a case of tubal rupture with a history of three weeks spotting. Tissue obtained at the end of three weeks by curettage.

with the exception of one case and in that instance if more material had been available we would probably have been able to find living chorionic tissue.

In the cornual pregnancy, there was typical decidua with a history

of forty days of bleeding, where only villi were found but no fetus. In one instance of abdominal pregnancy, typical decidua was found. There was a history of spotting for four and one-half months and a viable pregnancy in the abdomen.

DECIDUAL CASTS

In 8 instances uterine decidual casts were expelled. Of these 8, 5 occurred in 16 cases of tubal rupture (Fig. 3); 3 in 15 cases of tubal abortion (Fig. 4).

In one instance where a typical cast had been expelled, a curettage done a few days later showed a new formed typical decidua. The

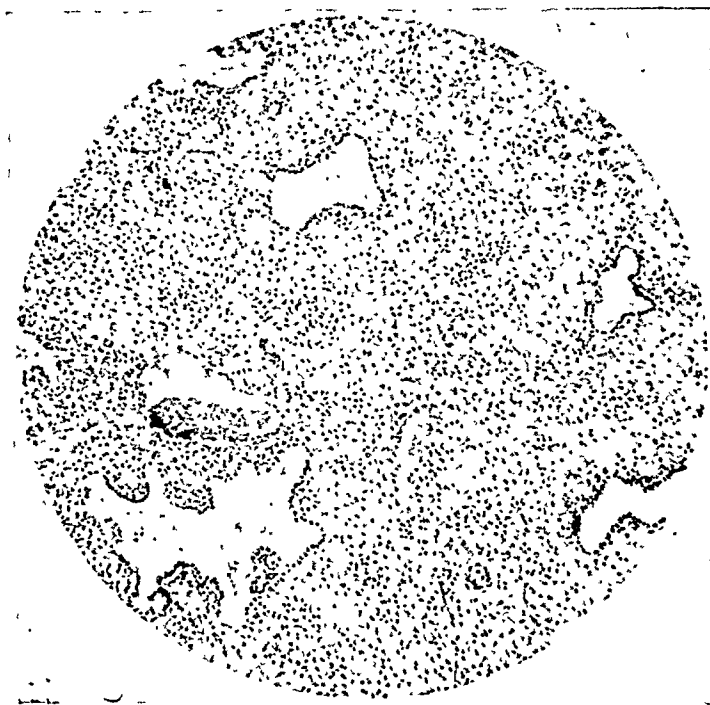


Fig. 3.—Typical decidual cast in a case of tubal rupture. Cast expelled three days postoperatively with no previous bleeding.

tube presented only a few viable villi. Of course, this may have been old decidua that had persisted after the cast was expelled. In three instances a cast was expelled postoperatively, in one instance, seventeen days after the onset of symptoms, the day of operation. In all but one case, bleeding was a premonitory symptom, and in 3 cases viable villi only were found in the tube. In the fourth case a fetal sac was found but no evidence of a fetus.

Three casts were obtained in 15 cases of tubal abortions, 1, one day postoperatively (typical cast), with a bleeding history of four weeks. The tube in this case showing viable villi. In the third case the cast was obtained fifteen days after the bleeding began. This bleeding lasted thirty-four days, which was up to the day of operation. Only

syncytium and Langhans cells and a few viable villi were found. In one unruptured case a typical cast was obtained two days postoperatively. There was a history of spotting for two and one-half months and at operation a placenta, which was eroding the wall, was found in the tube.

RESTING MUCOSAL STAGE

In 12 cases of tubal abortion, 7 showed interval mucosa, and in 6 instances degenerated villi were found in the tube and in the seventh a degenerated ovum (Figs. 7 and 8). In one case a premenstrual endometrium was found. All of these cases gave a history of bleeding

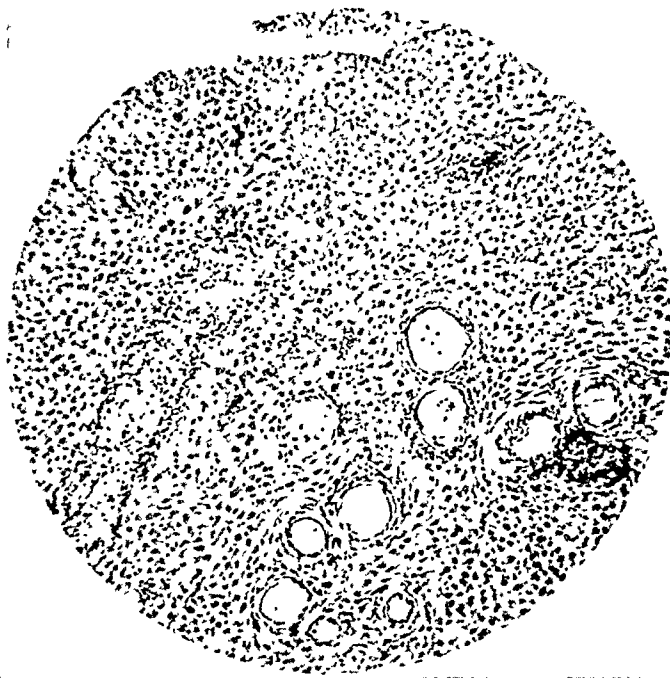


Fig. 4.—Typical decidual cast in a case of tubal abortion. Spotting for two months beginning two and one-half months after last regular period. Operation showed a viable fetus in the abdominal cavity.

from three to five weeks. In 3 of 4 unruptured cases, there was resting mucosa. In 2 of these, viable villi were found only in the tube, and in one, an eight weeks' fetus. In this latter case there had been previous bleeding for two weeks and in the other two cases, for three weeks.

TUBAL DECIDUA

Tubal decidua is much more difficult to find and is much less extensive in its distribution than uterine. In five cases of tubal abortion, more or less marked decidua was found in the tube (Fig. 5). In three instances there was no decidua in the uterus.

In the group of ruptured pregnancies, four cases showed decidua present in the tube (Fig. 6). In all but one there was a decidual

reaction in the uterus, and in all these cases viable villi were found in the tube. Apparently there is no definite relationship between the occurrence of uterine decidua and tubal decidua. Of course, in the uterus the decidua may be easily cast off, while in the tube it will persist for a long period of time before complete involution takes place so that it would not be at all unusual to find decidual reaction in the tube when none is present in the uterus. It also seems likely that decidua is much more common in the tube than has been hitherto believed and that study of sufficient material may demonstrate this. It is true that the tubal decidual reaction is not as extensive as that found in the uterus but that it occurs in small, widely separated



F.g. 5—Tubal decidua in a case of tubal rupture. This case had a curettage which showed typical decidua. Six days later abdominal section, three months viable fetus found in the abdomen. Tubal rupture, no bleeding from uterus since original curettage. Uterus obtained at autopsy showed decidual tissue.

patches. In our search we rarely found it on the surface or directly in the subepithelial connective tissue. It was most often present in the connective tissue septa of the villi in the neighborhood of the blood vessels, and undoubtedly persisted for a much longer period of time because the involutionary process in the tube at this depth is decidedly slower than in the uterus.

It is obvious that the histories show marked variation and that consequently a definite correlation between the presence of decidual reaction in the uterus, a history of bleeding and the tubal findings encountered, is extremely difficult. It is evident, however, that when there is no history of bleeding a typical decidua is present in the

uterus. On the other hand, even in spite of a long history of bleeding and in the absence of a viable fetus, uterine decidua may be found. In one instance as will be recalled, in spite of the fact that no fetus was found and that a typical cast was expelled, a subsequent curettage showed a definite uterine decidua.

The uterine lining may be cast off in fragments too small to be recognized. In the other instances the fragments are of sufficient size to be identified as uterine casts. The mechanism must be different in the two types of involution. As has been suggested by previous writers, thrombosis of the veins in the lower portion of the decidua causes separation of the entire uterine lining and due to the subse-

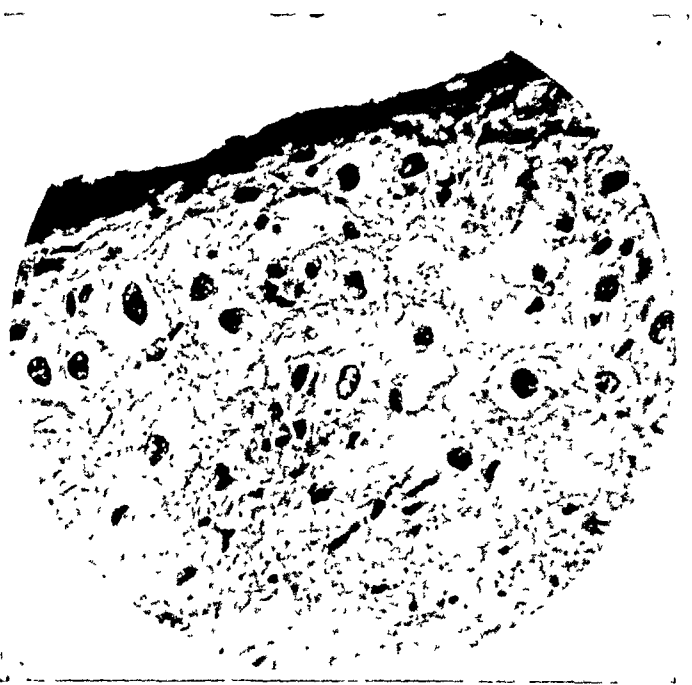


Fig. 6.—Tubal decidua in a case of tubal abortion. Uterus removed for coincidental bilateral tubal disease. Resting mucosa with a few tortuous glands and edematous compact layer. Forty day history of bleeding. Note intact surface layer. Tube showed degenerated and viable villi and syncytial cells.

quent uterine contractions, this tissue is expelled either in one large piece or in several pieces. The second type of involution possibly is due to the thrombosis of the vessels in the compact layer with necrosis and expulsion of smaller fragments which are unrecognizable in discharge.

Analysis of our cases shows a striking lack of regularity between symptoms and findings. In some instances with a long history of bleeding, decidua was found in the uterus, while in others with similar histories, no decidua was found. In some instances where viable villi were present, decidua was found in the uterus and not in others. Therefore the duration of the bleeding does not give a clue to the condition

of the uterus. The presence or absence of a fetus does not necessarily determine the reaction of the uterine mucosa. In many instances chorionic villi are found, some degenerated and some preserved, with the mucosa varying from the typical decidua to the typical interval. One factor seems to stand out, and this has been emphasized by Sampson and Novak, if there is no external bleeding one may expect to find a decidual reaction in the uterus. What the hormonal action is that causes and maintains the decidual type of mucosa, we cannot definitely state. It is also interesting to note that in the cases of tubal rupture, we encountered decidua in the uterus three times as frequently as in tubal abortion. It is worthy of em-

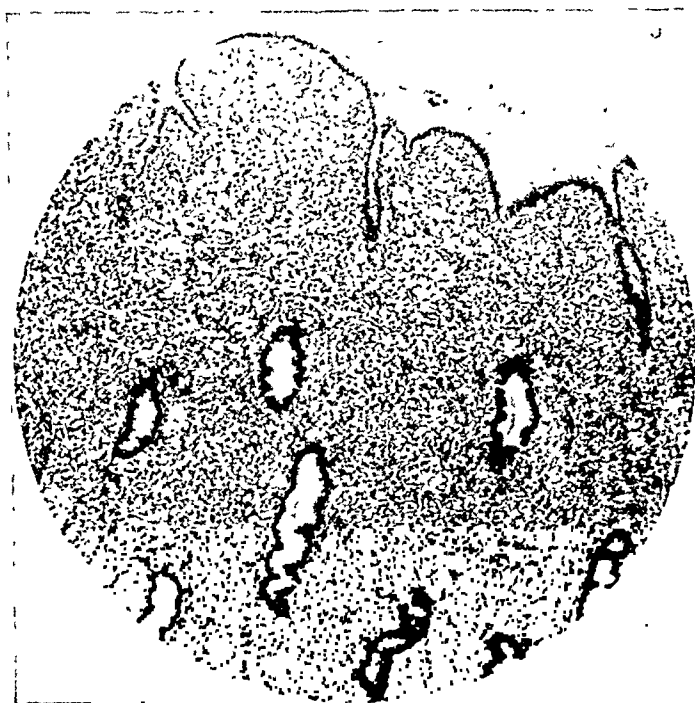


Fig. 7.—Resting mucosa. Tubal abortion. Bleeding six weeks; obtained by curettage. Laparotomy nine days later; still bleeding.

phasis that a viable fetus is more frequently found and that well-preserved villi are much more abundant in the ruptured pregnancy than in tubal abortion. Again a rather unusual circumstance was demonstrated by the investigation, i.e., that in spite of a long history of spotting and in some instances of profuse external bleeding for as long as fourteen to forty-eight days, a viable fetus was found despite this external evidence ordinarily considered as indicating the death of the fetus. In many instances, however, we found as did Novak and Sampson, that the fetus had disappeared and only chorionic villi were present.

The study of the casts obtained presented an interesting problem. They were usually expelled in one large piece or in several fair-sized

pieces, the usual time being seventy-two hours after operation. The expulsion of these casts was preceded by bleeding for from fourteen to forty-two days, while in one case there had been spotting for two months before the expulsion of the cast.

Where the death of the fetus and of the chorionic villi is incomplete and chorionic tissue continues to grow, even though most of the decidua has been expelled, the formation of a new decidua may be stimulated as evidenced by the interesting case quoted in the earlier part of the paper, where, following curettage, a new decidua developed. The question naturally presents itself whether or not the relative proportion of living chorionic tissue is not the deciding factor in the persistence of decidual reaction in the uterus.



Fig. 8.—Tissue showed typical resting mucosa with edematous stroma somewhat simulating decidua cells in a case of tubal rupture. History of prolonged bleeding. The tube showed chorionic villi and also decidua.

One rather unusual but interesting point must be made and that is the occurrence of external bleeding due to true trauma. We have had two cases where the patients thinking themselves pregnant have directly introduced some foreign body into the uterus which has caused external bleeding. Novak, too, had a similar case. This must always be thought of in weighing the clinical evidence before the diagnosis is made.

From an analysis of our findings we conclude the occurrence of bleeding in ectopic gestations may be attributed to a variety of causes:

1. Mechanical interference. Analogous to the number of normal pregnancies which are terminated by abortions, there are patients with

ectopic pregnancies who, thinking themselves normally pregnant, cause vaginal bleeding by methods to induce abortion.

2. There are many normal intrauterine pregnancies in which bleeding or spotting occurs especially in the early months and which nevertheless progress to term. Some of the bleeding in the ectopic may be of this nature.

3. We consider spotting a symptom of far less import than bleeding as an indication of ovular damage (see analysis of cases). Of 10 cases giving a history of spotting, 7 had decidua in the uterus, 1 no decidua, 2 expelled casts. The spotting in these cases was probably caused by uterine contractions initiated by efforts of tube to expel its contents. We would say that the spotting was evidence of tubal and uterine contraction but not of ovular death.

4. Bleeding, we feel, however, accompanies or precedes the casting off of the decidua and is initiated by actual death of chorionic tissue. This casting off of decidua may be in toto or gradual.

REFERENCES

- (1) *Sampson, John A.*: Surg., Gynec. & Obst., p. 587, May, 1914. (2) *Polak and Welton*: AM. J. OBST. & GYNEC. 3: 164, Feb., 1922. (3) *Polak, and Wolfe*: AM. J. OBST. & GYNEC. 3: 730, Dec., 1924. (4) *Novak, and Darner*: AM. J. OBST. & GYNEC. 9: 295, March, 1925. (5) *Lewers*: Lancet. 1: 9, 1911. (6) *Beaucamp*: Monatschr. f. Geburtsh. u. Gynak. 76: 260, 1927.

THE EARLY DIAGNOSIS AND PREVENTION OF CARCINOMA OF THE CERVIX*

A CLINICAL PATHOLOGIC STUDY OF BORDERLINE CASES TREATED AT THE FREE HOSPITAL FOR WOMEN

BY FRANK A. PEMBERTON, M.D., AND GEORGE VAN S. SMITH, M.D.
BOSTON, MASS.

IT IS generally agreed that the actual cause of carcinoma is not known, but that chronic irritation is an important exciting factor. This is exemplified in cancer of the cervix as clearly as in any organ of the body. It has been shown that cancer of the cervix is preceded by pregnancy in at least 90 per cent of cases. This figure is true of the series at the Free Hospital for Women reported by Graves.¹ Cullen² found it true in 90 per cent, Williams³ in 96 per cent, and Sampson⁴ in 97 per cent. In the other cases a history of inflammation, congenital erosion, gynatresia or some instrumentation, such as a dilatation, can usually be obtained. Cervicitis and erosion are prone to follow lacerations from childbearing, and the former may follow any instrumentation of the cervix. We agree with Lynch⁵ and others that

*Read by invitation before the Obstetrical and Gynecological Section of the New York Academy of Medicine on March 27, 1928. Received for publication, May, 1928.

the important etiologic factor is not the laceration but rather the consequent inflammation and chronic irritation.

The changes that occur in the epithelium of the cervix during the active and healing process of cervicitis must be kept clearly in mind. The normal cervical canal is lined with racemose mucous glands that lie deeply embedded in muscle and connective tissue. The epithelium lining the glands, their ducts, and the cervical canal itself is of the single-layered, cylindrical type. This epithelium extends down to the external os where it meets the squamous epithelium of the vaginal portion of the cervix. The latter is covered with a true epidermis consisting of a basal layer on which lie many layers of cells, varying from the round to the spinal type as the surface is reached. The point of junction of the two epithelia varies to some extent. Theoretically, it is at the external os. Practically, the cylindrical epithelium may extend to the outside of the cervix or the squamous epithelium may extend up into the canal to a greater or less extent, the point of junction being correspondingly placed. In the former case glands are found on the outside of the cervix and are prone to become infected.

When cervicitis occurs, the mucopurulent discharge from the glands macerates the squamous epithelium, leaving a denuded surface with scattered islands of more resistant epithelium. This stage of the process is called an erosion. The cylindrical epithelium, being less susceptible to these conditions, grows down over the raw area without changing its macroscopic characteristics. It is red and rough in appearance and bleeds easily. This stage is called pseudoerosion. If the inflammation is especially severe, even the cylindrical epithelium cannot grow. As the inflammation subsides, which it may do spontaneously, there is less discharge. The cylindrical epithelium that has covered the raw surface, no longer bathed with mucus, loses its vitality, while the squamous epithelium regains its vigor. Therefore, the squamous epithelium grows back to its normal position on the outside of the cervix, by proliferating under the edge of the cylindrical epithelium and gradually forcing it off. If the cervix has been lacerated and everted, some of the cervical glands are exposed in the vagina. In growing to the new external os at the edge of the laceration, the squamous epithelium surrounds and invades the ducts of these glands. Occasionally it fills a duct and forms a plug which may extend inward for some distance. When a cross-section is seen under the microscope, a first glance gives the impression of an epithelial prolongation deep in the tissue that is suggestive of cancer. This is the final stage of healing which endures as long as the cervicitis is quiescent.

These processes do not follow an orderly sequence. The chronic cervicitis may flare up and subside from time to time in the course of

years. The two types of epithelium are thus kept in a state of restlessness, sometimes over long periods. In view of this state of restlessness it is not to be wondered at that the growth of the epithelium may become excessive and encourage the development of carcinoma.

Another point in favor of the view that cervicitis stimulates cancer is that patients with procidentia very rarely have cancer of the cervix. There has been only one such case in 683 cases of third degree procidentia at the Free Hospital for Women. (This is the only case ever seen in the experience of the staff.) The cervix in procidentia is exposed to mechanical irritation and not infrequently is chronically ulcerated from friction. It remains dry, however, and is not subjected to con-



Fig. 1.—Photomicrograph of section from a trachelorrhaphy specimen removed in 1916. (Diagnosis: Chronic cervicitis.) Four years later the patient received radium for advanced squamous carcinoma of the cervix and died soon afterward. The original trachelorrhaphy specimen was rediagnosed carcinoma on the section from which the above picture was taken and on the patient's history. Note absence of basal layer on either side of A and to the right of B. The cells differentiate poorly. Mitoses are indicated by circles.

stant maceration, because there is little or no cervicitis and no obstruction to drainage. The squamous epithelium becomes thickened and hypertrophied, but remains in a stable condition.

During the period of warfare between the cervicitis and the two types of epithelium in the cervix, many different pictures are found which have been considered precancerous. When the squamous epithelium is proliferating during the process of healing, it is likely to grow in places in an atypical manner. Gross areas of leucoplakia may be seen; hypertrophy may take place even to the extent of polyp formation. Microscopically the cells may be larger and stain more

deeply than the normal; they may be somewhat irregularly arranged, especially in the transitional layers, and may show occasional mitotic figures. Prolongations often grow down into the stroma, especially in leucoplakic areas. Rarely epithelial pearls are found in these same areas even though the condition is not malignant (Halban and Seitz).

If the examination be thorough, these healing processes may be found in almost any case of cervicitis, with or without a preceding laceration. If these are precancerous conditions, then every lacerated or infected cervix is in a precancerous state. Fortunately cancer arises comparatively infrequently. It is just this infrequency which predicated the lack of knowledge of the actual causes that produce

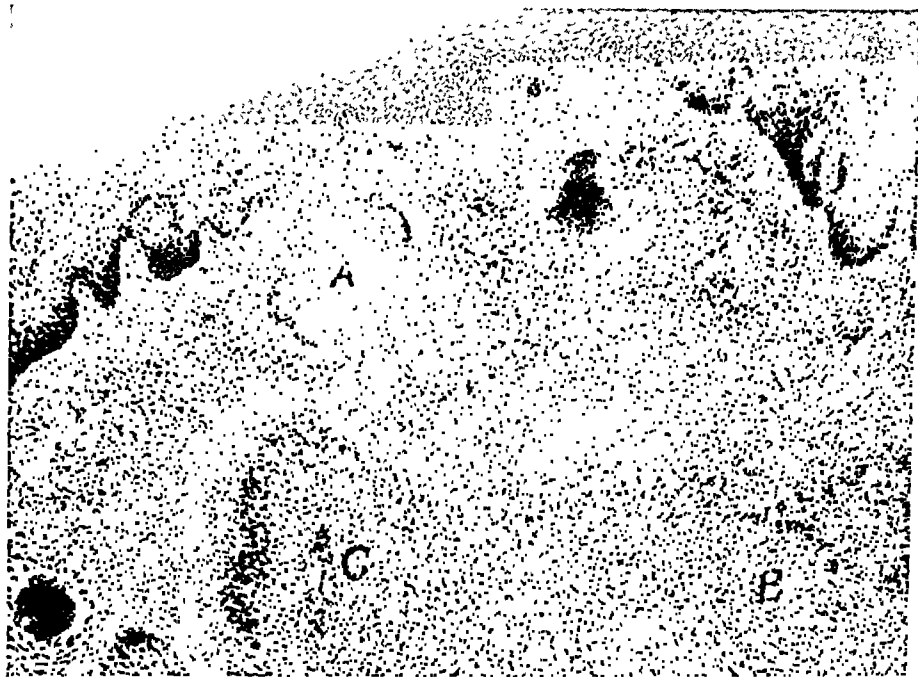


Fig. 2.—Early squamous carcinoma of the cervix. The patient was admitted in April, 1927, because of staining. Biopsy of curettings, of curettings from endocervix, and of specimen from the external os were negative. Eight months later the patient was readmitted. Three soft, red, bleeding ulcers, all less than 0.7 cm. in diameter, without raised edges, were found on the vaginal portion of the cervix at a distance of 0.5 to 1 cm. from each other and from the external os which appeared normal. Wassermann and pelvic examination were negative. The ulcers were excised and 200 mg. of radium (screened by 0.5 mm. of silver, 0.5 mm. of brass and 1 mm. of rubber) were applied for twenty-four hours. The patient is well and examination negative one year later. The above is from the edge of an ulcer. The squamous epithelium is hypertrophied. A comparison of A with B and C demonstrates the contrast between a benign and malignant overgrowth of squamous epithelium.

cancer. On the other hand, any patient having the condition described is liable to develop cancer. Since it is impossible to determine who will have the disease, all such patients should be treated in order to cure or remove the chronically inflamed tissue.

Although these healing processes are generally recognized, individual pathologists do not agree as to when the boundary between benign and malignant growth is reached. It is difficult to decide in any one

suspicious case whether cancer or precancerous changes are present. It is reasonable that this should be so because so many stages of change and growth may be found. It is important that the diagnosis be made before there is any destruction or gross infiltration of the stroma.



Fig. 3.—Hypertrophy and hyperplasia of squamous epithelium (from same trachelorrhaphy specimen as Figs. 4 and 5). There is a good basal layer and the cells differentiate well. This is a leucoplakic condition and is understood to be "precancerous." It is seen most commonly, however, in the cervix of cases with marked prolapse in whom cervical carcinoma is of very rare occurrence.

The histologic appearance which we have described above is benign. When this is accompanied by a basal layer which is undifferentiated from the transitional cells and, on closer examination, consists of irregularly arranged cells with mitotic figures, has no basement membrane,

and sends into the stroma prolongations fronted by an inflammatory infiltration, we feel justified in calling the condition one of early cancer.

The plugs of epithelium in the ducts of glands may be misleading, especially if they are cut on a slant. It must be remembered that they are the result of a normal healing process and, although suspicious, are not malignant unless there is poor differentiation and a general atypical arrangement of their cells. Areas of epithelium cut on the slant frequently show some irregularity of the basal layer but, if contiguous parts appear normal, these are not usually diagnosed as cancerous.

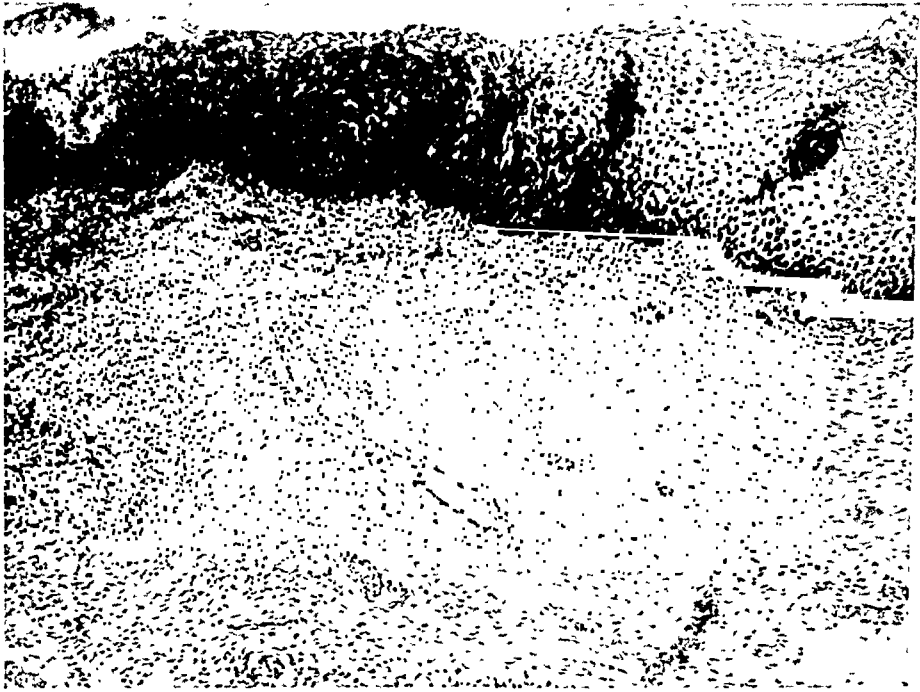


Fig. 4.—Section from trachelorrhaphy specimen from a patient treated for lacerations. Definite carcinoma is seen on the left; moderately hypertrophied epithelium on the right. At this stage the disease seems to be a process spreading laterally, but apparently not invading. Note distribution of inflammatory reaction. Of special interest in this case is the fact that the malignant changes are taking place in practically normal epithelium and not in the "precancerous" areas. The patient received 4800 mg. hours of radiation from screened radium and is now well one year, two months later.

It is wise to examine more than one part of the tissue microscopically because a malignant change may be found anywhere. This procedure is not difficult or time consuming. Three or four pieces of tissue are embedded in the same block, sections being cut at different levels.

We feel that one of the most important factors in the diagnosis of early cancer of the cervix is the experience obtained by studying many microscopic slides from cervical tissue. It is only by constant practice that one can distinguish between the many changes due to

inflammatory, reparative, and malignant processes. The tissues from other organs do not give analogous pictures.

The rule at the Free Hospital for Women since 1902 has been to examine microscopically all cervical tissue that has been removed for one reason or another. If the patient's history or the appearance of a cervix be at all suspicious, small specimens are taken for biopsy. In this manner cancer has been found microscopically in 16 cases in which neither the gross appearance of the cervix nor the gross characteristics of the tissue removed sufficed for a definite diagnosis. This figure is 2.39 per cent of the total number of cervical cancers seen at



Fig. 5.—High power from transition area of Fig. 4. This picture almost suggests a contagious rather than an invasive process. *A* and *B* indicate the borderline where the cells fail to differentiate.

the Free Hospital for Women. None of the group had had a previous cervical operation. One patient who had never been pregnant had a cervical polyp which showed adenocarcinoma with some squamous metaplasia. The others had had their last pregnancy from one to thirty-one years previously, the average being 15.18 years. Frank⁶ has found cancer microscopically in only 2 unsuspected cases, and others state that it is rare to discover the disease when the macroscopic appearance is not suggestive. Schottländer,⁷ on the other hand, found cancer on microscopic examination alone in 2 per cent of his cases.

We believe that all chronically inflamed and eroded cervixes should be treated or watched and that there should be no hesitation in re-

moving pieces for diagnosis. The danger of spreading the disease by instrumentation in cancer of the cervix is overrated. In a study of 550 cases of carcinoma of the cervix seen at this clinic, it was found that 13 of the 24 patients who lived longest after treatment had had preliminary curettage or curettage and cauterization. Janet E. Lane-Claypon,⁸ in reviewing a large series of autopsies, states that "the total number of cases having either glandular or visceral deposits was . . . 406 out of 914 cases, or 44.4 per cent. Therefore, on this very large series it is shown that over one-half of the patients died without any extension of the disease beyond the pelvis, and not even



Fig. 6.—"Suspicious cervix." Here the alveoli show mitoses and an active basal layer and the surface epithelium is markedly hypertrophied. The cells, however, differentiate well. The patient was well four years, seven months after trachelorrhaphy.

in the pelvic glands. That is, the patient died by direct extension of the growth, coupled, probably, with exhaustion from septic absorption." If this type of cancer were prone to metastasize, the ordinary activities of the patient and the invasive, erosive properties of the tumor would result in a very high percentage of metastases despite meticulous precautions in the matter of instrumentation; and any apprehension of this occurrence may now be avoided by use of the fine cautery or electric cutting needle.

In the treatment of chronic cervicitis most stress should be laid on curing the cervicitis, for when that is relieved the cervix will heal over. The treatment involves destruction or removal of the infected cervical glands. The methods now in use are the cautery, some form

of amputation of the cervix, radium, and repair of lacerations. Although treatment may not completely cure the cervicitis, it relieves the condition markedly; therefore, so far as chronic irritation is concerned, the treatment of cervicitis may be regarded as a preventive of future cancer.

Although it has not been proved scientifically that treatment of the diseased cervix is a prophylactic against cancer, there are some suggestive and fairly convincing facts.

In a series of 3814 trachelorrhaphies, 740 amputations, and 1408 cauterizations of the cervix, a total of 5962 cases, covering a period of fifty-two years at the Free Hospital for Women, only 5 are known

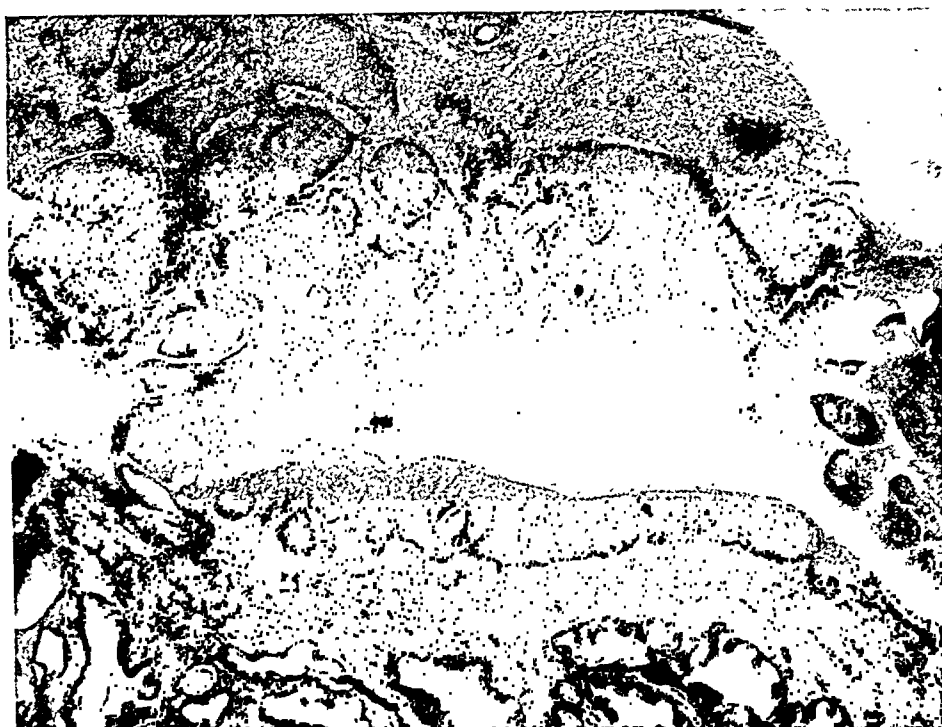


Fig. 7.—“Suspicious cervix.” This was the only section in which early carcinoma could not be ruled out with a fair amount of assurance. Despite the leucoplakia, alveoli and mitoses there is a fairly well defined basal layer and the cells differentiate well. The patient had her seventh child four years after the trachelorrhaphy and was well six months later.

to have developed cancer of the cervix, and these were in the trachelorrhaphy group.

Even more convincing are the figures of Levin⁹ who, in 613 cases of cancer of the cervix, found only 2 in which a previous cervical repair had been performed. We have found 12 such cases out of a total of 669 cancers of the cervix. In none of our series had there been any pregnancy between the repair operation and the time when carcinoma was diagnosed. The time relations between the last pregnancy, trachelorrhaphy, and diagnosis of carcinoma are given in Table I.

Eight cases (1909 to 1925) in which cervical specimens had been

diagnosed as precancerous were reviewed. Two were cervical polyps; the others were biopsy or trachelorrhaphy tissue. One patient was unmarried; the others had had their last pregnancy six months, a year and a half, a year and a half, eight, eight, fifteen and twenty-seven years previously. (Average 8.78 years.) Of five patients of this group whose suspicious cervixes received no further treatment,

TABLE I

INTERVAL BETWEEN LAST PREGNANCY AND REPAIR OPERATION	INTERVAL BETWEEN CERVICAL REPAIR AND DIAGNOSIS OF CARCINOMA	INTERVAL BETWEEN LAST PREGNANCY AND DIAGNOSIS OF CARCINOMA
1. 10 years	11 years	21 years
2. 16 "	6 "	22 "
3. 6 "	5 "	11 "
4. 10 "	8 "	18 "
5. 10 "	20 "	30 "
6. 9 "	7 "	16 "
7. 1 month	16 "	16 "
8. 7 years	12 "	19 "
9. 1 year	7 "	8 "
10. 7 years	10 "	17 "
11. 19 "	9 "	28 "
12. Unknown	Unknown	9 "
Average 8.63 years	Average 10.9 years	Average 19.53 years

1 is untraceable (letter, state directory and state death records) and 4 were alive and well five years three months, seven years five months, fourteen, and nineteen years later, respectively. The other 3 patients were considered to be in sufficient danger to merit prophylactic radium application (25 to 150 mg. screened by 0.5 mm. of silver and 1 mm. of rubber for from five to twelve hours). One of these patients died five weeks later, after an operation at another hospital. The other 2 are well three years two months and six years four months after operation.

The sections from 150 routine trachelorrhaphy specimens for the year 1922 were then reexamined and 20 were classed as suspicious and possibly precancerous. The patients had had their last pregnancies one to thirty-four years previously. (Average 7.67 years.) Four had radium treatment (100 to 150 mg. for from ten to twelve hours); 1 is untraceable, the others are well from four to five years after operation. Of the 16 remaining patients 2 are untraceable and 14 are well four and one-half to five and one-half years after discharge from the hospital.

One hundred and ten sections from cervical specimens for the hospital year 1915-1916 were reexamined, and 15 were considered suspicious. One patient had never been pregnant. The others had had their last pregnancy one, one, one and one-half, two, three, four, five, five, six, seven, nine, ten, twelve, fourteen, and sixteen years previously. (Average 6.57 years.) Eight are untraceable; the other 7 are well from nine to twelve years after discharge.

Thus, in these series not one patient whose cervical specimen was

suspicious but not malignant has been found to have developed cancer, although sufficient time has elapsed since operation. It is not improbable that the repair acted as a preventive in at least a few of these patients. Only more extensive studies along the lines indicated above can point to more definite conclusions. The most impressive fact is the long interval between pregnancy and repair (8.63, 8.78, 7.67 and 6.57 years); between pregnancy and the diagnosis of carcinoma (19.53 and 15.18 years); and between repair and the diagnosis of carcinoma (10.9 years).

It would seem that if chronic irritation is an important factor in the etiology of cancer, as is believed by most authorities, the body must present strong defense against it, because the irritant requires so long a time before it produces the malignant change. It is easier to discover this period of time in carcinoma of the cervix than in that of the lip, tongue, stomach, etc., since the date of the beginning of the inflammation can be more definitely set. The facts that the trauma of pregnancy has occurred previously in at least 90 per cent of cases of carcinoma of the cervix and that very few patients with cancer give a history of repair operations on the cervix are good evidence that the treatment of inflamed, eroded cervixes is a valuable prophylaxis against cancer.

SUMMARY AND CONCLUSIONS

1. The histology of the normal and pathologic cervix uteri has been briefly summarized. Its precancerous and early cancerous changes have also been described.

2. Long experience in the study of cervical tissue is necessary if one is to decide in any given instance whether or not cancer is present.

3. Of 669 cases of carcinoma of the cervix seen at the Free Hospital clinic, 2.39 per cent were diagnosed on the basis of microscopic examination, the gross findings being inadequate for a diagnosis.

4. There should be no hesitation about excision of cervical specimens for biopsy. In this series no harm is known to have come to a patient from the procedure, and it was a life-saving measure in 10 of the 16 cases of early cervical carcinoma. The other 6 carcinomas were found by routine microscopic examination of trachelorrhaphy specimens.

5. That only 5 out of 3814 patients on whom trachelorrhaphy was performed, and that none out of 1408 whose cervixes were cauterized, and that none out of 740 whose cervixes were amputated are known to have developed carcinoma, suggest that treatment of diseased cervixes may be a prophylactic measure as regards the incidence of cancer. That only 12 out of 669 patients with carcinoma of the cervix had had trachelorrhaphy and that none had had cauterization or amputation, also suggests the prophylactic value of careful cervical treatment.

6. Long follow-ups of patients whose cervical specimens were microscopically suspicious failed to find the development of carcinoma in any instance. Although in the very rare case it cannot be decided microscopically whether or not cancer is present, in the majority of cases the decision may be made quite definitely.¹

REFERENCES

(1) *Graves, W. P.*: J. Obst. & Gynæc. Brit. Emp. 34: 2, 1927; *Idem*: Gynecology, ed. 4, Section on Cancer of the Cervix. (2) *Cullen, T. S.*: Cancer of the Uterus, Philadelphia, 1909, W. B. Saunders, p. 411. (3) *Williams, Roger*: Brit. Gynæc. J., 1895-96. (4) *Sampson, J. A.*: J. A. M. A. 56: 101, 1911. (5) *Lynch, F. W.*: Pelvic Neoplasms, Appleton & Co., 1924. (6) *Frank, R. T.*: Gynecological and Obstetrical Pathology, Appleton & Co., p. 272, 1924. (7) *Schottländer, L.*: Wien. klin. Wchnschr. 49: 1912. (8) *Lane-Clayton, Janet E.*: Cancer of the Uterus, Appleton & Co., 1927. (9) *Levin*: J. A. M. A. 69: 1068, 1917.

¹We desire to thank Dr. W. P. Graves for his kind and valuable assistance and also to thank Miss S. Danziger for her technical work and Mr. E. E. Fewkes for his photomicrographs.

A ROENTGENOGRAPHIC STUDY OF PLACENTAL INFARCTS

BY HERBERT THOMS, M.D., F.A.C.S., NEW HAVEN, CONN.

(From the Woman's Clinic, Yale University School of Medicine)

THE study of the circulatory changes of the human placenta by means of the usual microscopic methods has been most extensive. On this subject alone the literature has amassed to such an extent that at the present time it would appear that a great deal of further information is not to be expected from this form of investigation alone. With a view to approaching the subject in some other manner, we have, during the past year, made a study of placentas injected with barium sulphate, and then roentgenographed in a manner to be described in this communication. In this way, we have been able to see what relationship of local circulatory disturbance was to the entire placental circulation. To paraphrase a well-known expression, we have overlooked the trees in order to study the forest. We have, of course, also employed the usual microscopic methods of investigation, in order to check the results of our procedure. In discussing this approach to the subject, mention should be made of the work of Fraser,¹ who used a somewhat similar procedure in a study of placental circulation. To those interested in the architecture of placental circulation, his paper contains valuable information. The chief interest of the present communication has been directed toward placental circulatory arrest due to infarct formation, and the measurement of such arrest on a percentage basis.

The findings in the cases which have been studied for this purpose are interesting but not revolutionary, and in presenting the work attention is drawn not only to these results but also to the method of investigation. The technic, therefore, will be first described.

After some experimentation, the following procedure has been found satisfactory, and adopted as a routine for this study.

As soon as the placenta is delivered, it is dropped into a vessel containing enough 5 per cent sodium citrate solution to cover the specimen entirely. The injection may be done at once, or if more convenient, which is usually the case, at a later period. In the latter instance, the container and specimen are placed in the ice box, where they may remain as long as twenty-four hours without affecting the success of the injection.

When the injection is to be made, the following steps are to be carried out: The cord is cut about two inches from its base and a double flanged cannula is inserted into the umbilical vein and held in place with a mass which ligature encloses both arteries and vein. The placenta is transferred to a basin of warm water (about 60° C.), and a bottle containing physiologic saline is placed in the same basin. The proper connections having been made, the saline is washed through the placenta under a pressure of 125 mm. mercury. Back-flow through the arteries is watched for, and as distention takes place, the arteries are cut near the cannula and the blood is washed out. Washing is continued under pressure for twenty minutes until the organ is pale and no blood is present in the back-flow. The specimen is then removed from the basin and a small cannula with a small flange is inserted into each artery. These cannulas are connected with a Y-tube, through which the injection material passes. The following formula is used for the injection:

Distilled water	1700
Gelatine	300
Barium sulphate	1000
Thymol	2

This solution is heated to 50° C., and as before put into the basin with the specimen. The same pressure is used, and the maternal surface is carefully watched to determine the presence of the solution in the cotyledons. After about fifteen minutes the injection is complete. The placenta is removed and placed in cold water to solidify the gelatine. The specimen is now ready for the roentgenograph of the flat specimen. After this procedure, the specimen is placed in 10 per cent formalin, where it remains for from twenty-four to forty-eight hours. When sufficiently hardened, the placenta is cut into strips approximately 1 cm. wide, which are laid parallel to one another on a sheet of glass. A roentgenogram of these strips is now made. By studying the cross-sections not only may small areas of circulatory arrest be noted, but the percentage of such arrest in relation to the total placental circulation may be readily computed. Since injections made in this manner in no way disturb the histologic structure of the placenta, it is our custom when infarcts are noted in the gross, or when circulatory arrest is seen in the roentgenogram, to take sections for microscopic study.

From our study of 58 placentas prepared in this way, certain facts emphasized themselves:

First.—Marginal white infarct formation is so common that it may be considered a normal phenomenon of the mature placenta. The amount of circulatory disturbance at the edge of the placenta as a result of such infarcts is so slight as to be negligible.

Second.—The small white infarcts which are so frequently seen scattered over the fetal surface are for the most part purely surface affairs in the greater number of cases; there is no change in the

PLACENTA NUMBER	PERCENTAGE AREA INFARCTED	GROSS APPEARANCE	PRESENCE OF TOXEMIA	REMARKS
1. P 6406	No measurable infarction	Normal appearance	None at any time	
2. P 6431	3% infarcted	Normal appearance	None at any time	Labor complicated by pre-mat. separation; version and extraction. See figs.
3. P 6440	No measurable infarction	Normal, large size	None at any time	
4. P 6443	No measurable infarction	Normal appearance	None at any time	
5. P 6441	No measurable infarction	Normal appearance; few calcified areas	None at any time	
6. P 6442	No measurable infarction	Normal appearance	None at any time	
7. P 6444	No measurable infarction	Normal appearance	None at any time	
8. P 6432	No measurable infarction	Normal appearance; sl. marginal infarct	None at any time	
9. P 6430	No measurable infarction	Normal appearance; placenta bipartia	No toxemia during pregnancy	B.P. on admission 160/80. No other signs present
10. P 6429	No measurable infarction	Normal appearance; cord-marg. insert.	None at any time	
11. P 6428	No measurable infarction	Normal appearance	None at any time	
12. P 6511	No measurable infarction	Normal appearance; Marginal infarct 2/3 circumference	None at any time	
13. P 6490	No measurable infarction	Partial marginal infarct; 1/3 circum.	None at any time	
14. P 6510	No measurable infarction	Partial marginal infarct; 1/3 circum.	None at any time	
15. P 6612	No measurable infarction	Normal appearance; Small infarct (white) 3x3 cm. at base of cord	None at any time	(Infarct at base of cord superficial, no interference with circulation)
16. P 6525	No measurable infarction	Normal appearance; sl. marginal infarct	None at any time	
17. P 6538	No measurable infarction	Normal appearance	None at any time	
18. P 6539	No measurable infarction	Normal appearance	None—see note	(Patient said to have had a "convulsion" at home, but no evidence of toxemia could be demonstrated at the hospital)
19. P 6541	No measurable infarction	Normal appearance; marg. infarct 2/3 circumference	Not at any time	
20. P 6540	2% infarcted	Marg. infarct 1/3 circumference—several white infarcts near marg.	Not at any time None at any time	
21. P 6548	No measurable infarction	Normal appearance; infarct at base of cord 2x3 cm.	None at any time	

PLACENTA NUMBER	PERCENTAGE AREA INFARCTED	GROSS APPEARANCE	PRESENCE OF TOXEMIA	REMARKS
22. P 6531	5% infarcted	Marginal infarct 2/3 circumference; infarct 4x3 at margin	None at any time	
23. P 6570	No measurable infarction	Marginal infarct 2/3 circumference; few small white infarcts on fetal surface	None at any time	
24. P 6574	13% infarcted	White infarct 5x6 cm. at base of cord	None at any time	
25. P 6560	No measurable infarction	Normal appearance	None at any time	
26. P 6584	5% infarction	Marginal insertion of cord; white infarct 3x4 cm. fetal surface at base; marginal infarct 3/4 circumference	None at any time	
27. P 6581	No measurable infarction	Marginal infarct 4/5 of circumference	None at any time	
28. P 6585	No measurable infarction	Marg. infarct 2/3 of circumference; few small white infarcts on fetal surface	None at any time	
29. P 6591	No measurable infarction	Marginal infarct 1/3 circumference		
30. P 6610	No measurable infarction	Marginal infarct 1/3 circumference	Definite preeclamptic toxemia, induction of labor, followed by return to normal	
31. P 6609	No measurable infarction	Small infarct at base of cord; fetal surface	None at any time	
32. P 6603	No measurable infarction	Normal appearance	None at any time	
33. P 6602	No measurable infarction	Marginal infarct 2/3 circumference	None at any time	
34. P 6600	No measurable infarction	Marginal infarct 1/3 circumference	None at any time	
35. P 6619	No measurable infarction	Marginal infarct 2/5 circumference; white infarct 3x3 cm. at base of cord	None at any time	
36. P 6618	No measurable infarction	Marginal infarct 4/5 circumference; white infarct 3x3 cm. at base of cord	None at any time	
37. P 6627	15% infarcted	2 white infarcts 4x4 cm.; fetal surface; marginal infarct 4/5 circumference; white infarct at margin 3x3	Pt. induced for preeclamptic toxemia at eighth month	
38. P 6594	No measurable infarction	Marginal infarct 1/3 circumference	None at any time	
39. P 6597	No measurable infarction	Marginal infarct 1/3 circumference	None at any time	
40. P 6596	No measurable infarction	Normal appearance	None at any time	
41. P 6590	No measurable infarction	Normal appearance	None at any time	
42. P 6613	No measurable infarction	Marginal infarct 1/3 circumference	None at any time	
43. P 6617	No measurable infarction	Marginal infarct 2/3 circumference	None at any time	

PLACENTA NUMBER	PERCENTAGE AREA INFARCTED	GROSS APPEARANCE	PRESENCE OF TOXEMIA	REMARKS
44. P 6632	No measurable infarction	Normal appearance	Definite nephritis toxemia of pregnancy	
45. P 6638	No measurable infarction	Normal appearance	None at any time	
46. P 6628	No measurable infarction	Marginal infarct 2/3 circumference; white infarct 2x3 cm. at base of cord	None at any time	
47. P 6620	No measurable infarction	Marginal infarct 2/3 circumference; few small white infarcts on fetal surface	None at any time	
48. P 6647	12% infarcted	Fetal surface, marg. infarct 3x6 cm.; maternal surface several white infarcts, largest measure (10x2) (3x4) (2x1) cm.	None at any time	
49. P 6644	No measurable infarction	Placenta succenturiata, lobe 7x4 cm.	None at any time	
50. P 6646	No measurable infarction	Marginal infarct 2/3 circumference; few small white infarcts on fetal surface	None at any time	
51. P 6655	No measurable infarction	Marginal infarct 3/4 circumference; base of cord infarct 10x5 cm.; several 1-3 cm. on fetal surface	None at any time	
52. P 6656	24% infarcted	Marginal 1/3 circumference	None at any time	
53. P 6661	No measurable infarction	Marginal 1/3 circumference	None at any time	
54. P 6669	4% infarcted	Marginal 1/2 circumference; base of cord 4x4 cm.	None at any time	
55. P 6645	No measurable infarction	Marginal 3/4 circumference	None at any time	
56. P 6678	No measurable infarction	Marginal 2/3 circumference; few scattered white infarcts on fetal surface	None at any time	
57. P 6678	No measurable infarction	Marginal 2/3 circumference	None at any time	
58. P 6679	10% infarcted	Marginal 2/3 circumference; white infarct 3x3 cm. near margin	No toxemia. Patient probably a chronic alcoholic	

subjacent circulation. This statement applies also to the white infarcts which are so frequently noted at the place of insertion of the cord. In fact, infarcts on the fetal surface, even of wide extension, seldom affect the circulation of the placenta to any degree. We have seen a large area of the fetal surface involved by a white infarct, yet, on cross-section and roentgenographic examination have found the circulatory arrest limited to structures lying one or two millimeters below the fetal surface.

Third.—In this series no definite relationship between infarct formation and the toxemia of pregnancy was noted. We observed

typical cases of toxemia in which no apparent circulatory disturbance was seen, and on the other hand, infarct formation with measurable circulatory arrest was noted in a number of cases in which no sign or history of such toxemia could be elicited.

In the accompanying table, where the amount of circulatory arrest was less than 1 per cent, a notation of "no measurable infarction" is made. The method of computing the amount of such arrest is a matter of studying each cross-section strip roentgenogram, calculating the circulatory arrest of that strip, and so the percentage of

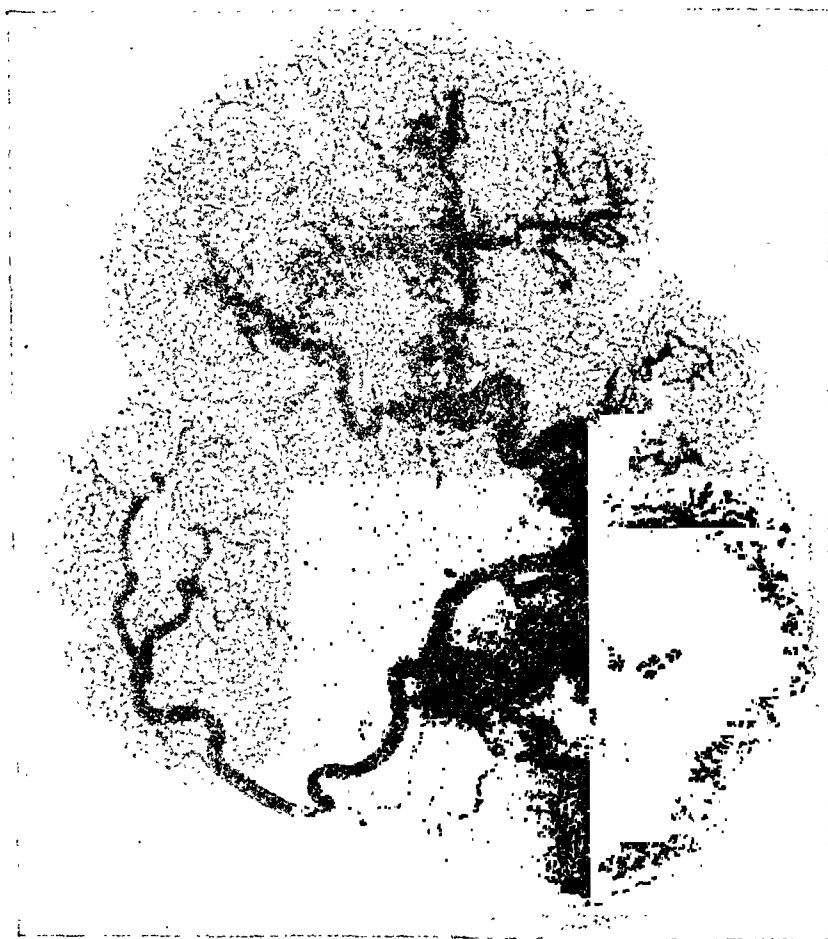


Fig. 1.—Roentgenogram of placenta (flat plate). No measurable circulatory arrest due to infarct formation.

arrest for the entire organ. Some idea of just what such percentage of arrest means may be gained from the investigations of Dodds,² who showed that the area of the villi in the human placenta at term is about seven square meters.

COMMENT

In this study of 58 placentas injected and roentgenographed in the manner described, 10 placentas, or 17 per cent, were found infarcted to a degree which actually interfered with the placental circulation. In one case (P 6656), 24 per cent of the placental circula-

tion was thus arrested by the process, yet there was no evidence of maternal toxemia or of ill effect upon the baby. I have no doubt that in the study of a larger series than here reported an even greater amount of placental infarction may be present with the same

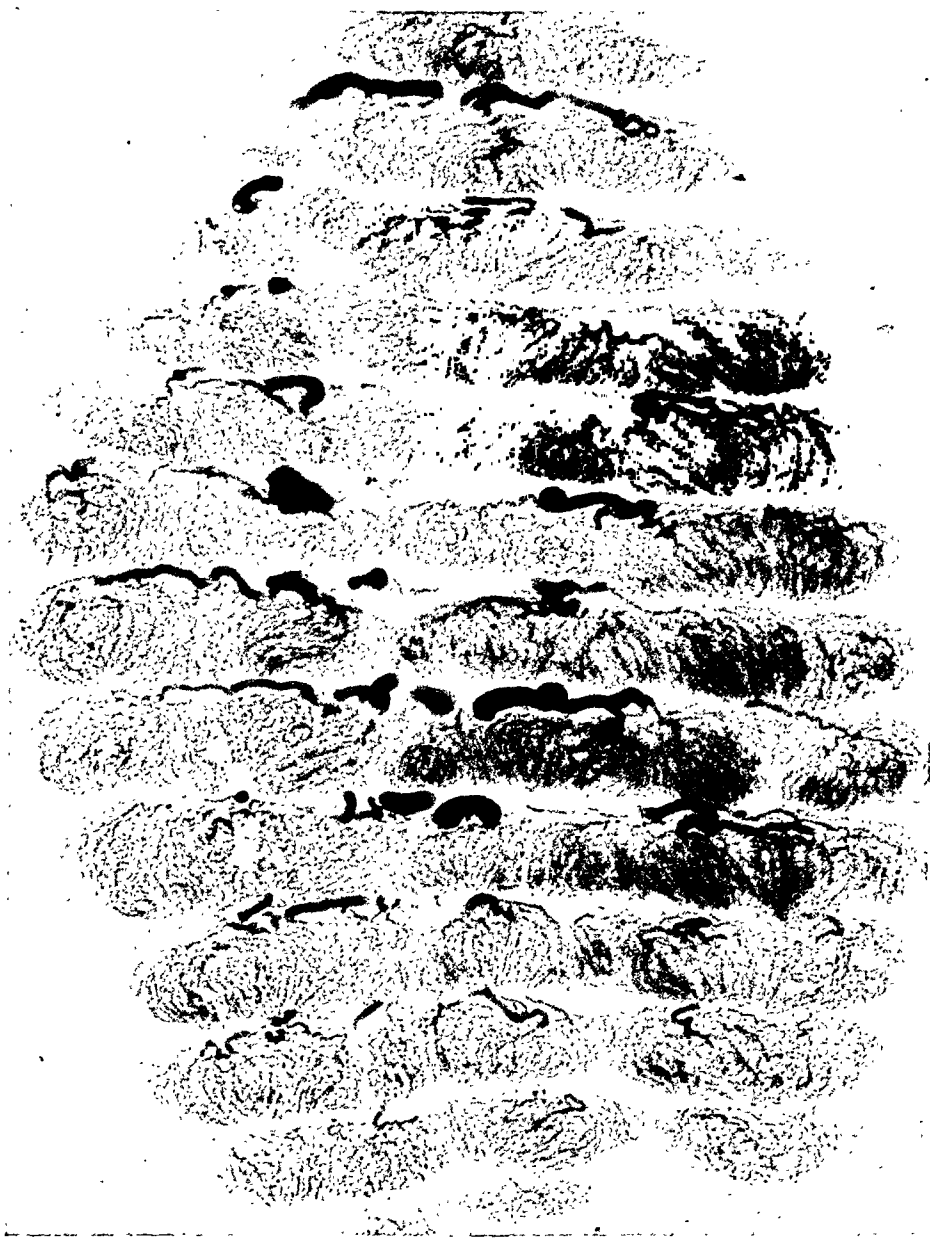


Fig. 2.—Roentgenogram of cross-section strips of placenta. No measurable circulatory arrest due to infarct formation.

finding. It is, however, only by some such method as here delineated that the actual amount of such infarction can be estimated.

In studying the accompanying table, the frequency of marginal infarcts and infarcts on the fetal surfaces at the entrance of the cord, as recorded in the gross description, is noteworthy.

Infarct formation in the placenta may be said to resemble eclampsia

in that it is a "condition of theories." In the main, however, the etiology of placental infarction, as set down principally by Young,³ offers the most attractive explanation of their formation. The chief foundations for this theory are those which he has so ably pointed out. First, chorionic elements are most active during the early stage of development, before fetal vessels are formed. Second, villi proliferate in hydatid mole, and in this condition there are no fetal vessels. Third, tips of villi remain healthy in tubal pregnancy, where the blood supply from the ovum has been cut off by hemorrhage, but where the maternal circulation is unimpaired. From the present investigation, and from previous studies⁴ which I have made, I am led to agree with Young that the villi are dependent upon maternal blood for their nourishment and growth.

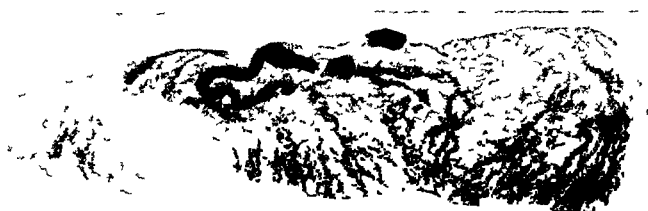


Fig. 3.—Showing circulatory arrest due to infarct formation. See gross cross-section (Fig. 4).

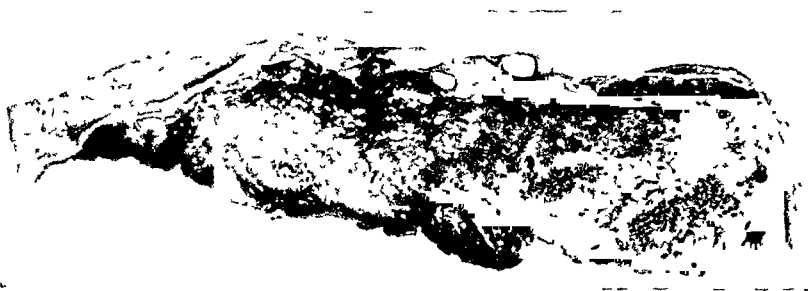


Fig. 4.—Cross-section of placenta showing white infarct near edge of placenta on maternal surface.

Anything, therefore, which interferes with the nutrition of the villi may be expected to produce the lesions which are characteristic of placental infarct formation. This interference is produced by changes in the maternal circulation at the site of placental implantation, and is brought about as a result of interruption of the blood supply of the maternal spaces. That such interruption does occur in the latter months of pregnancy in the uterine sinuses as a result of thrombosis was first brought to our attention by Friedlander, and confirmed by Minot,⁵ who observed as early as the seventh month large thrombi in the venous sinuses of the muscular layer of the uterine wall underlying the placental site. Clementz⁶ states that the condition is essentially a necrosis, which is secondary to the clotting of maternal blood in the intervillous spaces. This clotting may be initiated by fibrin

deposits upon the villi with localized epithelial defects, and is aided by the slowness of the blood stream in the placental circulation.

These observations seem to account very well for infarcts seen in their various stages of formation in the substance of the placenta or on the maternal surface of that organ, but for those superficial white infarcts which are so frequently seen limited to the fetal surface and to the margin of the placenta, it would appear that either another speculation or an extension of the above theory becomes necessary. I believe the latter to be the case; that is, that these superficial white infarcts are also an expression of the failure of the maternal blood to carry on the nutrition of the villi. It is probable that it is difficult

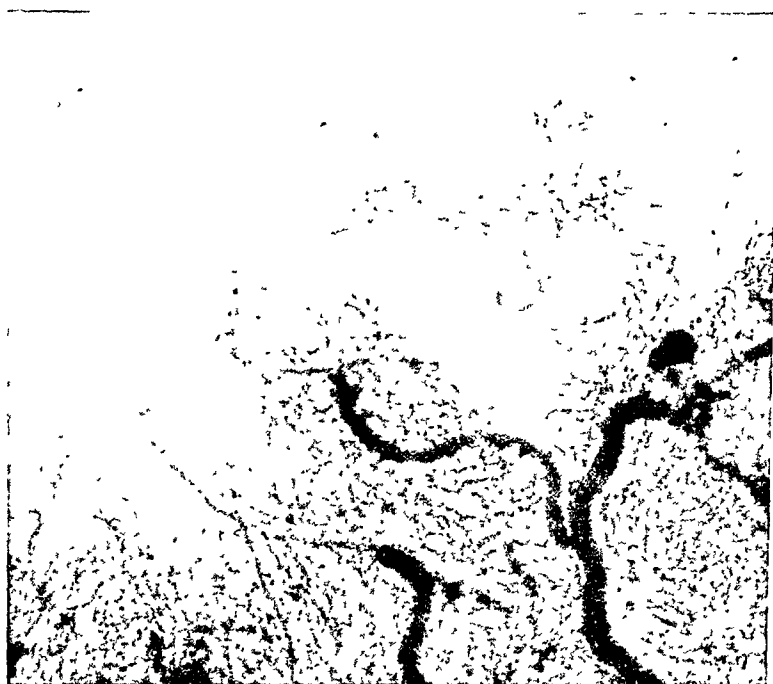


Fig. 5.—Infarct at edge of placenta, roentgenogram showing circulatory arrest. Flat picture.

for the villi to carry on their existence at certain points remote from the uterine sinuses. This accounts for the frequency of white infarct formation upon the fetal surface at the entrance of the cord vessels, where, especially in the latter months of pregnancy, the maternal circulation may be insufficient to carry on the proper nutrition of the villi. It also accounts, I believe, for the frequency of white marginal infarcts. It is not difficult to imagine that at the very edge of the placenta, particularly in the latter weeks of pregnancy, the maternal circulation may be so poor as to interfere with the proper nutrition of the villi at this point. Nor is it difficult to understand the gradual growth by extension of a necrosis of this sort. Another proof of the maternal nutrition theory is found in the fact pointed out by Eden⁷ that in the membranes immediately outside of the placenta embedded

villi may be found in all stages of atrophy and disappearance, an exact counterpart of the process seen in infarction. This theory also accounts for the fact that fetal surface and marginal infarcts are practically always of the white (anemic) type. On microscopic examination they show a close packing together of the villi, with no blood in the intervillous space, as if their very remoteness from the maternal sinuses were the primary cause of the failure of nutrition.

Such a condition would presuppose a change particularly in the maternal arterial circulation of the uterus, and that this does occur before labor was pointed out by Goodall⁸ in his work on involution of the uterus.

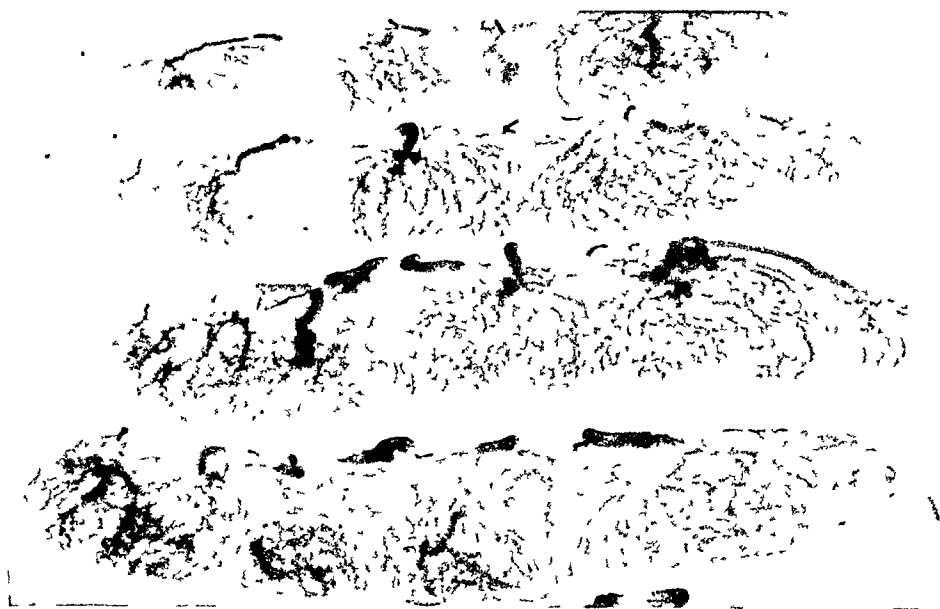


Fig. 6.—Cross-section roentgenogram of Fig 5, showing circulatory arrest due to infarct formation.

While no attempt in the present investigation has been directed toward the etiology of red (hemorrhagic) and white (anemic) infarcts, yet in commenting upon the cause of these two varieties, it seems to me obvious that their production may be explained by the usual method of their formation in other locations.

With regard to the present investigation of placental circulation, it may further be observed that vascular changes in the entire placenta may be shown to students in a manner not possible with other demonstration.

REFERENCES

- (1) *Fraser, J.*: AM. J. OBST. & GYNEC. 6: 645-655, 1923. (2) *Dodds, G. S.*: Anat. Rec. 24: No. 5, 1922. (3) *Young, J.*: J. Obst. & Gynaec. Brit. Emp. 26: 1, 1914. (4) *Thoms, H.*: New York State J. Med., 140: 1090, Dec. 2, 1916. (5) *Quoted by Eden* (reference below). (6) *Clements*: Ztschn. f. Geburtsh. u. Gynäk., 84: 758, 1922. (7) *Eden, T. W.*: J. Path. & Bact. 4: 265-283, 1897. (8) *Goodall* (Quoted by McNalley and Dieckman): AM. J. OBST. & GYNEC. 5: 55-66, 1923.

NEW HAVEN HOSPITAL.

THE DIAGNOSIS OF EARLY PREGNANCY THROUGH THE DETECTION OF FEMALE SEX HORMONE IN THE URINE

A PRELIMINARY REPORT

BY CHARLES MAZER, M.D., AND JACOB HOFFMAN, A.B., M.D.
PHILADELPHIA, PA.

(From the Department of Gynecology of the Mount Sinai Hospital)

THE need of an accurate test to determine the gravid state is generally recognized. The sugar tolerance test is commonly spoken of as of some value. The weakest point in the sugar tolerance test is not its failure to diagnose pregnancy in 40 per cent of the cases, but rather the large number of positive results it yields in nonpregnant women. (Scheffey.¹) In this respect the test herein described is of much greater value. The normal nongravid state yields only a weakly positive reaction in 8 per cent.

Aschheim's and Zondek's² discovery of anterior pituitary hormone in the urine of pregnant women and its application in the diagnosis of early pregnancy was the incentive for our investigation as to the presence of ovarian hormone in the urine of women during early gestation. Parenthetically, permit us to note the difference in action between the anterior pituitary hormone and the sex hormone present in the unruptured ovarian follicle, the corpus luteum, and placenta. The first is said to exert its influence on the ovaries, causing immature follicles to ripen and corpora lutea to form. In fact, Zondek³ designates the anterior hypophysis "the motor of ovarian activity." It has no direct influence on the uterine and vaginal mucosa. The female sex hormone, on the other hand, exerts little or no influence on the follicular apparatus. It does, however, as demonstrated by Allen and Doisy,⁴ have a profound stimulating influence on the lower genital tract, bringing about estrus in castrated mice and rats.

Contrary to the observations made by Aschheim and Zondek,² we found varying quantities of female sex hormone in the urine of pregnant women as early as one week after the first missed period. With the advance of pregnancy the hormone is demonstrable in the urine in greater concentration.

The detection of ovarian hormone in the urine, as compared with the complicated procedure of demonstrating anterior pituitary hormone, is comparatively easy and applicable in the routine work of a gynecologic laboratory.

Allen, Pratt, and Doisy⁵ demonstrated the presence of follicular

hormone in the human corpus luteum of early pregnancy, and larger and increasing quantities in the growing placenta.

Frank and Goldberger,⁶ despite their ingenious method, were unable to detect this hormone in 40 c.c. of human blood before the tenth week of pregnancy, when placentation is definitely established. Thereafter they found the hormone concentration in the blood in direct ratio with the growth of the placenta.

Employing the method of these two investigators, we have examined the blood of a large number of women during the different menstrual phases and various stages of pregnancy and can subscribe to the accuracy of their observations.

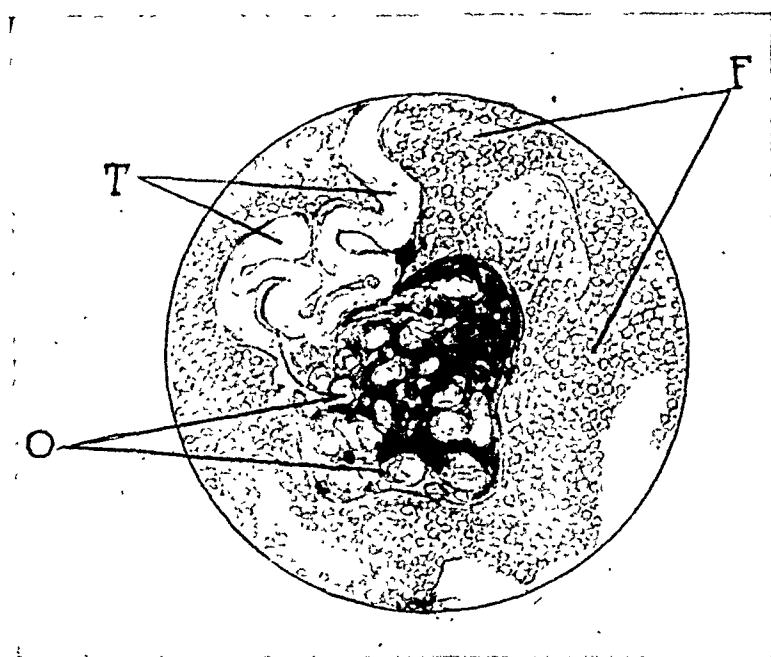


Fig. 1.—Drawing of ovary of mouse as seen when pressed between two slides (low power). *F*, fat; *T*, tubes; *O*, ovary.

It seems paradoxical that the hormone of the corpus luteum of early pregnancy should appear in the urine long before it can be demonstrated in the circulation. Its absence in the urine of most non-pregnant women, even during the last ten days of the menstrual cycle when blood tests, according to the method devised by Frank and Goldberger,⁶ reveal sex hormone in great concentration, cannot easily be explained. For the want of something more tangible, we must assume that the lower threshold and increased renal permeability of early pregnancy permit the small quantity of ovarian hormone then present in the blood to filter through, thus depleting the blood of the hormone. Later, when the placenta supplements the function of the corpus luteum of pregnancy, large quantities of sex hormone appear in the blood, apparently more than the permeability of the

kidneys will permit to filter through. Its presence is then easily demonstrated, both in the blood and in the urine.

We employed the method of Allen and Doisy,⁴ who demonstrated the succession of changes in cell types found in the vaginal lumen of mice and rats during the estrual cycle. Vaginal smears thus serve as indicators of its various phases. As these cyclic phenomena are no longer present after castration, their reappearance following the injection of urine obtained from pregnant women proves beyond doubt that the urine contains female sex hormone.

No test of early pregnancy is of value if the nongravid state yields positive reactions in many cases. It was therefore necessary to test the urine of women during the various phases of the menstrual cycle,

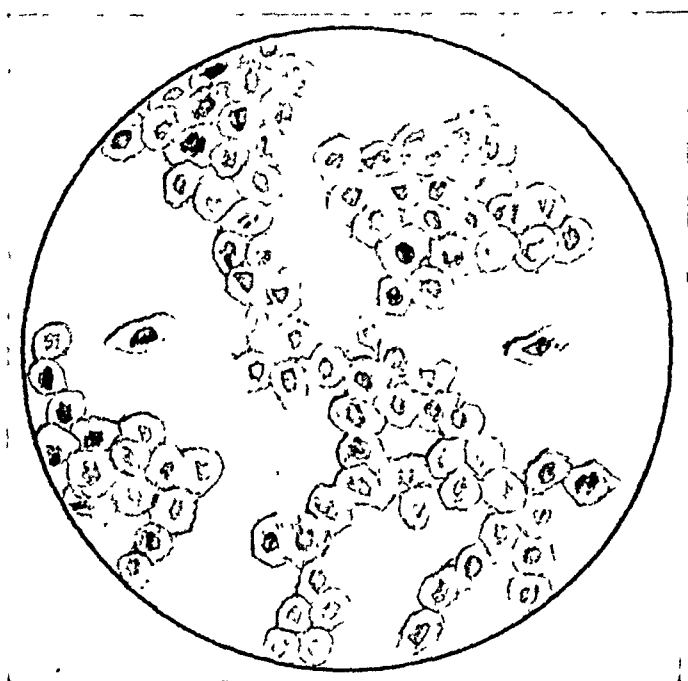


Fig. 2.—Vaginal smear in proestrus: nucleated epithelial cells.

the early menopause, and lactation. The accompanying tables show that the normal nongravid state yields less than 8 per cent of weakly positive reactions.

Acute inflammation of the pelvis renders a high percentage of positive reactions. This test can therefore not be utilized in differentiating between this condition and ectopic gestation.

In two cases herein reported, the reaction antedated the first missed period by a few days. Pregnancy was not suspected in these cases when the urine was tested for the presence of female sex hormone.

TECHNIC

Before castration is attempted, the white mice employed in this work are first tested in regard to regularity of their estrual cycle; old animals may have unresponsive genital organs.

Castration is performed under ether anesthesia through the muscles of the back. An incision is made over the spine, the skin flaps retracted and the ovaries removed through a puncture wound in the overlying muscles. A peritoneal fold running from the ovary to the kidney region is a reliable guide. The specimen, flattened between two slides, is immediately put under the microscope to make sure that the ovary is included in the tissue removed. It is seldom necessary to suture the mus-

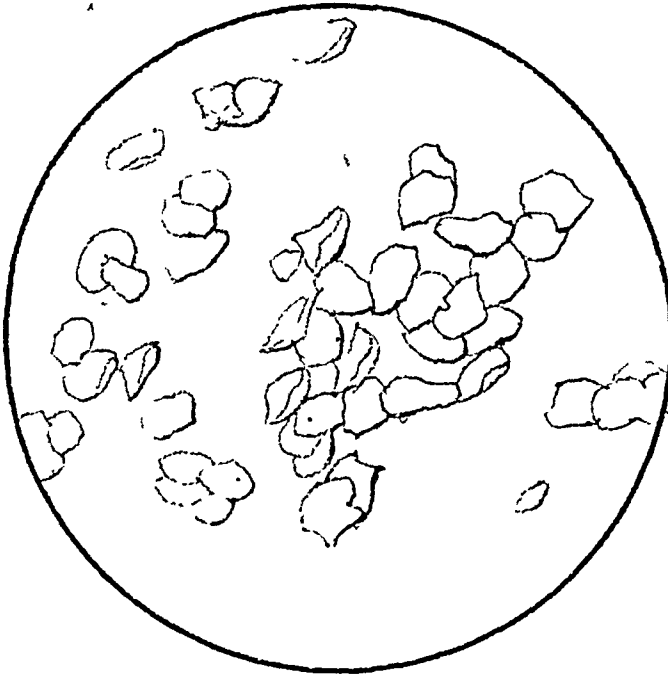


Fig. 3.—Vaginal smear showing estrus: cornified nonnucleated cells.



Fig. 4.—Vaginal smear showing diestrus: epithelial cells, leucocytes, and mucous shreds.

TABLE I

URINE OF PREGNANT WOMEN	POSITIVE	NEGATIVE
A few days before the first missed period	2	0
The week after the first missed period	8	.2
Second week after the first missed period	7	1
Third week after the first missed period	6	2
Fourth week after the first missed period	6	0
Fifth week after the first missed period	6	1
Third month of pregnancy	8	0
Fourth month of pregnancy	8	0
Fifth month of pregnancy	10	0
	61	6

TABLE II

URINE OF NONPREGNANT WOMEN	POSITIVE	NEGATIVE
First week of the menstrual cycle	1	10
Second week of the menstrual cycle	2	24
Third week of the menstrual cycle	2	28
Fourth week of the menstrual cycle	2	22
Menorrhagia due to hyperplasia	0	6
Puerperium	2	2
Lactation period	0	7
Menopause	0	11
Uterine fibroids	0	6
Ovarian cyst	1	0
Amenorrhea of unknown cause	1	7
Acute pelvic inflammatory diseases	4	4
	15	127

cle wound. The skin incision is closed with linen thread. The experienced technician can do this operation in five minutes with a mortality below 5 per cent. The castrated animal is then kept under observation for two weeks. Vaginal spreads are examined daily in order to exclude the presence of an accessory ovary or regeneration of an overlooked fragment. We maintain a steady supply of 100 castrated animals for the pregnancy test herein described, and for the detection of female sex hormone in the blood of women suffering from ovarian dysfunction, as outlined by Frank and Goldberger⁵

Two animals are simultaneously injected with twenty minims of catheterized urine at two-hour intervals consecutively five times. Daily vaginal smears are continued and recorded in an individual small book dedicated to each animal. When evidence of activity appears in the vaginal spreads, it is necessary to examine the vaginal secretions two or even three times during the following twenty-four hours in order that an estrus may not be overlooked. If only one animal shows a positive reaction, the reliability of the test is thereby not impaired, because urine of normal nonpregnant women rarely shows a strong reaction. The failure of one of the two animals to react strongly to the hormone stimulation may be due to atrophy of the vaginal mucosa incident to a prolonged interval between castration and the test.

Much depends on the correct interpretation of the vaginal spreads.

Diestrus: negative, if there is a preponderance of leucocytes, mucus, and an occasional epithelial cell.

Proestrus: weakly positive, when the vaginal smear contains only a few leucocytes, an excess of nucleated epithelium, and some nonnucleated squamous epithelial cells.

Estrus: positive, if the spread contains no leucocytes, no mucus, a preponderance of nonnucleated squamous epithelial cells, and some nucleated epithelial cells.

Strongly positive if the smear shows only nonnucleated epithelial cells.

One should guard against possible pitfalls if an erroneous diagnosis is to be avoided. The platinum loop, if unskillfully handled, may carry some nonnucleated squamous epithelial cells from the vulva and thus convey the impression that these cells are derived from the vagina.

It may be assumed that sex hormone in the urine of women during early pregnancy is not demonstrable in every case because of insufficient concentration. When larger quantities of urine are injected, the test animals invariably die before the appearance of the reaction. The quantity of urine injected is relatively in excess of the weight of the test animal. We are now developing a method of concentrating the urine so that a smaller quantity may yield more hormone for test purposes.

REFERENCES

- (1) *Scheffey, Lewis, C.*: AM. J. OBST. & GYNEC. 14: 202, August, 1927. (2) *Aschheim, S., and Zondek, B.*: Klin. Wehnschr. 7: 8, Jan. 1, 1928. (3) *Zondek, B., and Aschheim, S.*: Klin. Wehnschr. 6: 1322, 1927. (4) *Allen, E., and Doisy, E. A.*: J. A. M. A. 81: 819, Sept. 8, 1923. (5) *Allen, Pratt, and Doisy*: J. A. M. A. 85: 399, Aug. 8, 1925. (6) *Frank, R. T., and Goldberger, M. A.*: J. A. M. A. 86: 1686, May 29, 1926.

1829 PINE STREET.

A MYOMA, A SARCOMA, AND A CARCINOMA DEVELOPING IN THE SAME UTERUS*

REPORT OF A CASE WITH A REVIEW OF THE LITERATURE

BY Q. U. NEWELL, M.D., F.A.C.S., ST. LOUIS, MO.

(From the Department of Gynecology, Barnes Hospital and Washington University Medical School)

MYOMA of the uterus is a very common condition; carcinoma of the uterus is fairly common, and sarcoma of the uterus is rare. It is exceedingly rare to have all three types of neoplasm arising in the same uterus and, in reviewing the literature, I have found only four such cases reported. Also, I have found only 20 cases reported of carcinoma and sarcoma coexisting in the same uterus. Probably this condition has occurred more frequently than one imagines, but due to diversified opinion of different pathologists the condition has not been recognized; in the future probably many more cases will be recorded as uterine tumors are studied more carefully.

The object of this paper is to report a case in which a myoma, a sarcoma (spindle cell), and an adenocarcinoma occurred in the same uterus, with a brief review of the literature on this subject.

CASE REPORT

Clinical History.—B. M. A., negress, aged fifty-seven years, was admitted to Barnes Hospital, September 28, 1927, complaining of pain in the lower abdomen

*Read before the St. Louis Gynecological Society, March 9, 1928.

and vaginal bleeding. The family history was irrelevant. The patient was married twice; two pregnancies by first husband, one pregnancy by second husband. Two pregnancies were miscarriages at four months and two months respectively. One child, full term, lived to be fifteen years old and died of heart disease. She has no living children. Her menses began at the age of twelve years and had always been normal until nine years ago when they became profuse and then gradually diminished in amount, and at the age of fifty-three years patient reached menopause in a normal manner.



FIG. 1.

The patient dates the onset of her present illness to nine years ago when she consulted a physician for profuse menstruation and was told she had a myoma in the uterus. She was at that time advised to have an operation, but she refused and took much medicine; she seemed to improve and thought she was well until four years ago (fifty three years of age) when she reached menopause. Several months after menopause, following intercourse, she noticed a slight vaginal bleeding which lasted for several months. Then there was complete absence of any vaginal discharge until February, 1926 (about twenty months ago), when, following a tooth extraction, she noticed a moderate vaginal bleeding for three days which then stopped for several days but recurred at irregular intervals. Since October, 1926, about one year ago, the bleeding has been more profuse and more

frequent. Had some pain in the lower abdomen. Lost considerable weight in the past four years; had a good appetite; the bowels were constipated.

The physical examination was essentially negative except for the abdomen and pelvis. In the lower abdomen could be palpated a definite, firm, nodular mass extending about 8 cm. above the symphysis pubis, apparently arising in the pelvis and fixed. Vaginal examination revealed an enlarged, conical cervix, not eroded and with no evidence of malignancy. The fundus contained many nodules varying in size from that of a marble to that of an orange, forming altogether a mass about the size of a grapefruit. The mass filled the pelvic inlet and made it impossible to palpate either adnexa.

Clinical Diagnosis.—Myoma (multiple) of uterus. Malignancy of the fundus of the uterus cannot be excluded.

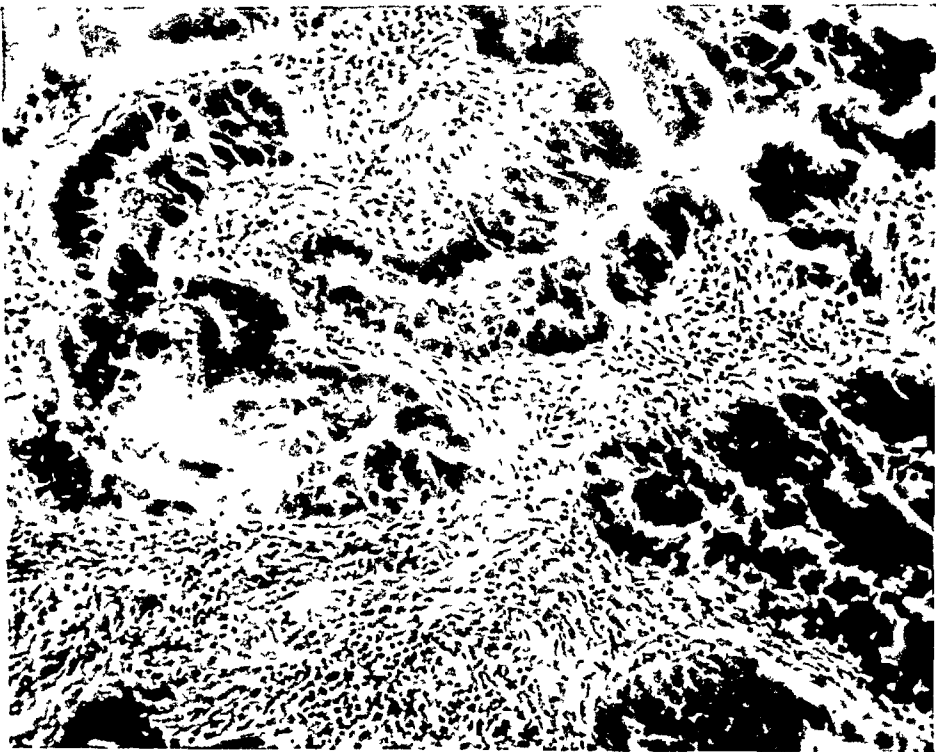


Fig. 2.

Operation.—October 4, 1927 (Dr. Q. U. Newell), abdominal complete hysterectomy, bilateral salpingo-oophorectomy.

Usual midline subumbilical incision. A diastasis of the recti muscles was present. Upon opening the peritoneal cavity a nodular tumor was encountered which was a myomatous uterus. The mass was easily delivered from the abdominal cavity, as no adhesions were present. The complete uterus, with both tubes and both ovaries, intact, was removed in the usual complete hysterectomy routine. A small rubber tissue drain was inserted into the vagina and the vaginal stump closed. All clamped pedicles were ligated and brought to vaginal stump and made fast. The bladder peritoneum was then brought over the vaginal stump and sutured to the posterior surface, covering all raw surface with peritoneum. Abdomen was closed in routine manner.

The postoperative course was uneventful and the patient was discharged from the hospital, October 17, 1927, thirteen days after operation.

Subsequent Course.—Patient was advised to return to the hospital in six weeks for deep x-ray therapy to the pelvis but failed to do so. March 1, 1928, Social

Service Department located the patient and brought her to the Gynecological Out-patient Department. On pelvic examination I found the pelvis practically clear with no evidence of recurrent malignancy.

Pathologic Note.—Diagnosis: Sarcoma of the uterus arising in a myoma. Adenocarcinoma corporis uteri. Myoma uteri.

Gross Pathology.—Material consists of uterus and both tubes and both ovaries. The uterus is very irregular, about 9 cm. long with several subserous myomas, the largest being about 6 cm. in diameter. The uterine cavity contains a polypoid mass, very edematous. This mass arises from the endometrium of the uterine cavity at its uppermost portion with a broad base and almost fills the entire cavity; several small areas, about 1 cm. in diameter and raised, are noted along the lowermost portion of the uterine cavity. Suggests adenocarcinoma. (Fig. 1.)

Microscopic.—Section A shows a piece of cervix extending up to the uterine cavity. The epithelial covering is intact, but beneath it there is moderate round



Fig. 3.

celled infiltration. Section B shows a mass of myoma tissue pushing up under the endometrium. The latter has undergone definite malignant proliferation, and nests of uterine epithelium are growing back into the uterine wall in an infiltrating manner. (Fig. 2.) Section C shows more of this carcinomatous process, but at the same time in the myoma one sees a beginning proliferation of large spindle cells from the tissue about the blood vessels. These cells are large and have large deeply staining nuclei. The picture is that of sarcomatous change in a preexisting myoma. (Fig. 3.) Section D, taken from a myoma on top of the uterus, shows bundles of smooth muscle fiber arranged in whirls which interlace in every direction; in areas it is very cellular, although there is no evidence of malignancy. Also marked hyaline degeneration is present. (Fig. 4.)

The case may be briefly summarized as follows: Multiple myomas are present throughout the uterus and in one of these myomas a

sarcomatous change is noted; the uterine cavity is filled with a polypoid mass, resembling a bunch of grapes, which arises from the endometrium and is an adenocarcinoma of the fundus.

DISCUSSION

Cases of myoma, sarcoma, and carcinoma arising in the same uterus have been reported by Niebergall, Ivanoff, Rabl-Rueckhard, and Schaller. Cases of sarcoma and carcinoma in the same uterus have been described by Gebhard, Jaffe, Emanuel, von Franqué, Opitz, Amann, P. Findley, Lagreze, Moise, Nebesky, Otto Franqué, Oskar Frankl,

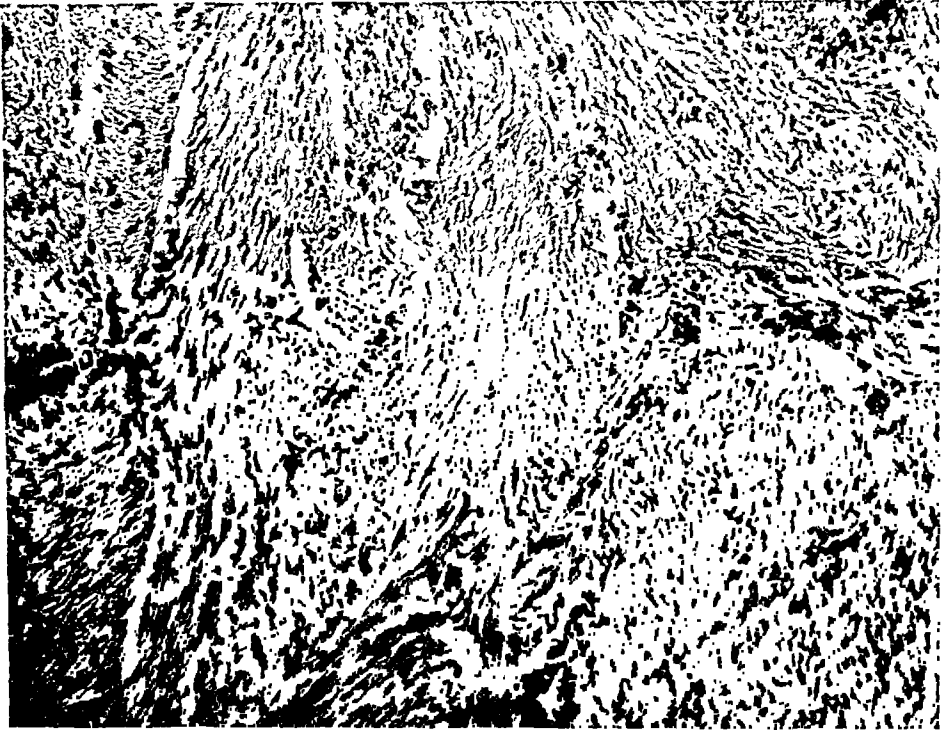


Fig. 4.

and Ballin. All of the authors have seen one case each, with the exception of O. Frankl who studied 8 cases. His cases are reported over a period of 15 $\frac{3}{4}$ years, and he treats with this condition in detail. In none of his cases was a myoma present. He states that it is possible for the same uterus to have both carcinoma and sarcoma. They may be closely approximated or distinctly apart. He has studied the pathology of these tumors very carefully and recognizes the fact that an accurate diagnosis is sometimes very difficult and urges that a definite terminology be used when describing these tumors. The term sarcoma plus carcinoma applies to separate tumors, carcinosarcoma to mixed tumors in which sarcoma and carcinoma are intimately mixed, and carcinoma sarcomatodes to a carcinoma which has characteristics of growth of sarcoma.

Virchow referred to these tumors under the name carcinoma sarcomatodes, believing they were true mixed tumors in which both epithelium and connective tissue were represented in the neoplastic growth. Certain pathologists uphold Virchow's description while others claim that these cases are instances of two separate growths arising independently in the same organ.

Herxheimer, in discussing the pathology of sarcoma and carcinoma in the same uterus, suggests three possibilities: (a) that a carcinoma and sarcoma may develop simultaneously as the result of the same cause acting on different tissues; (b) that the atypical proliferation of epithelium on the base of a preexisting sarcoma may lead to the development of a carcinoma within a sarcoma, and (c) that the stroma of a carcinoma may undergo a sarcomatous change.

Ewing, in treating with the pathology of sarcoma and carcinoma in the same uterus, suggests the following: (a) the simultaneous occurrence of two separate tumors which may invade one another; (b) the development of carcinoma at the point where a submucous or mural sarcoma meets the epithelial layer, and (c) carcinomatous changes in the glands of a sarcomatous or inflammatory polyp.

Claessen and Mathias, in reviewing the subject of carcinosarcoma occurring in the same organ, have collected 72 cases which they accept as authentic, viz., uterus 20 cases; breast 15; ovary 12; thyroid 7; esophagus 4; stomach, liver, lungs, kidney, 2 each; gall bladder, pancreas, pharynx, tube, prostate, nose, 1 each.

Most of the cases reported in literature were adenocarcinomas of the body and cervix, and sarcomas arising from either the endometrium or myometrium and not sarcomas arising in a myoma. One can readily see how difficult it is to make an accurate diagnosis when the two malignancies spring from the interior of the uterine cavity and encroach upon each other in such a way that the cells often lose their characteristics. It is not so difficult in the case reported herewith, where all three tumors are separated from each other. The carcinoma is of the adeno type situated high up in the body of the uterus, the sarcoma arising in a myoma lying in the wall of the uterus.

The author wishes to take this opportunity to express his indebtedness to Dr. I. Y. Olch, Department of Surgery, for the pathologic report.

411 WALL BUILDING.

EPISIOTOMY WITH MODIFIED OPERATIVE TECHNIC*

By W. J. BLEVINS, M.D., WOODLAND, CALIF.

(From the Department of Obstetrics, Woodland Clinic)

WE THINK of a woman in confinement as undergoing a normal, physiologic process and expect that nature will care for her functions without interference. Unfortunately our assumption is not always founded on fact. The birth of the first child is an event of vital importance, for complications may occur at this period which sometimes threaten life and very often permanently impair health.

Almost every primipara suffers some perineal laceration. Sometimes the tear is obvious but of minor degree. In these cases repair can be effected very easily and satisfactorily. Frequently the tear is extensive and the effort at repair results only in a partial restoration of the normal anatomic relations. Sometimes the lacerations are submucous and escape detection. In either of the two latter conditions, the basis is laid for years of suffering and ill health. The gynecologist can best estimate the penalty that women pay because of the lack of skill of the average physicians who attend them in confinement. Rectocele with chronic constipation, cystocele with persistent cystitis, prolapse of the pelvic organs with their attendant major and minor discomforts, and numerous other complications can usually be traced directly to the first labor which did not follow an entirely normal physiologic course.

It is not the purpose of this paper to discuss those conditions which give rise to the various complications. Whether the child's head is too large, the soft tissues of the perineal floor too inelastic or labor pains too violent, the results are the same. The perineum gives way in the line of least resistance, the ultimate result being frequently one or more of the pathologic conditions above mentioned. Physicians have recognized this fact for ages. Hippocrates tried to prevent perineal lacerations by the application of oily salves and relaxing douches and, even to this day, the same attempt is made by some by the application of hot fomentations and by supporting the perineum with sponges during the moments of greatest stress. In the seventeenth century Van Horn tried to obviate the complications by manual dilatation with forcible pushing back of the coccyx. This method is still used by some.

Considering the strides made in surgery within the past generation it is remarkable that so little attention has been given to certain obvious and logical surgical procedures which will prevent the com-

*Read at the Meeting of the California Northern District Medical Society, Woodland, April 10, 1928.

plications incident to confinement. Episiotomy is not a recent procedure. As far back as 1742, Ould cut the vulvar outlet when it offered too great a resistance to the escape of the head. In 1810 Michaelis used the episiotomy, considering a surgical incision, even in those days when there was no aseptic technic of less consequence than an uncontrolled tear. Ritgen and Schultze made numerous small

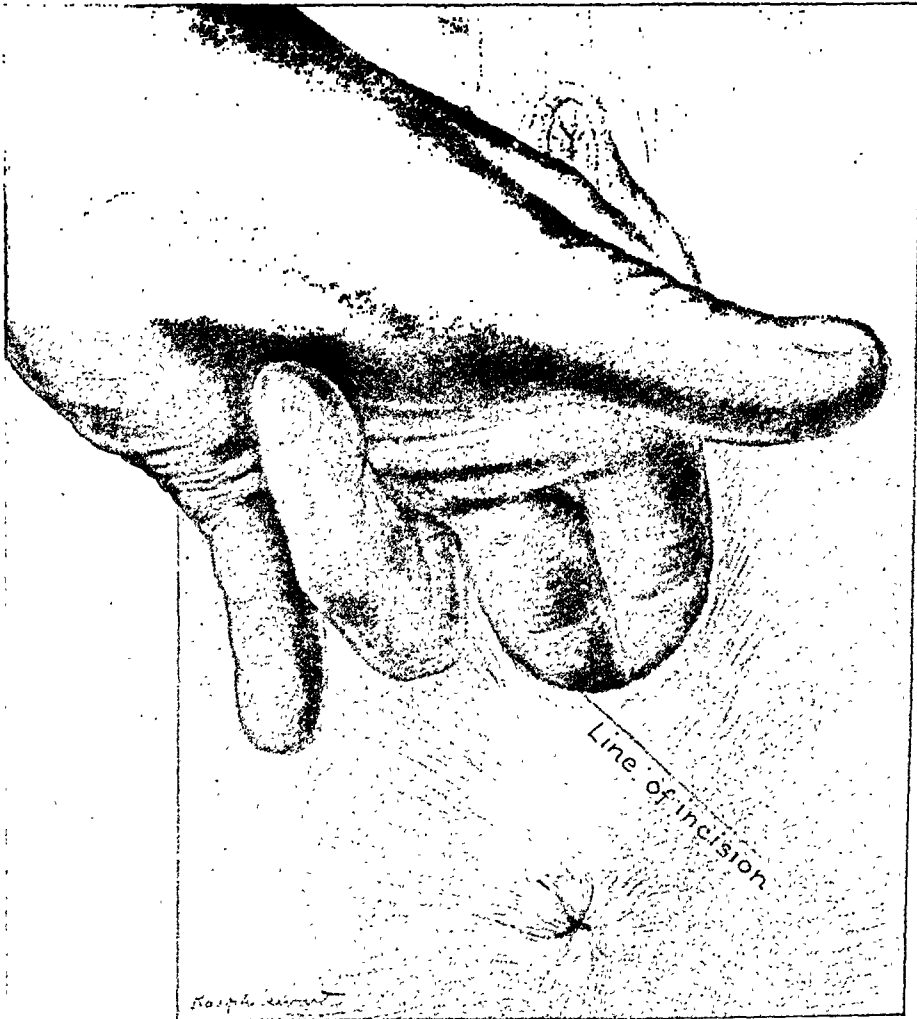


Fig. 1.—Line of incision midway between anus and tuberosity of ischium.

incisions in the tense vulvar ring. Sconzoni recommended two lateral incisions, Crede, one, directed from the frenulum toward the tuberosity.

From the time of Ould it has been considered to make a clean incision to avoid a laceration of indeterminate extent. Yet how few men doing obstetrics as a part of their general practice are familiar with or employ this simple surgical procedure? Simple as it is, it will, in almost every instance, prevent the laceration which may render the patient a chronic invalid. When the tissues of the perineum begin to separate under stress it is impossible to know where the severance

will end. The laceration may extend into the rectum, or rupture the anal sphincter, which disaster will reflect on the competence of the physician. We believe that such an accident always can and should be prevented by an episiotomy.

The indications for an episiotomy are: (1) A resistant perineum, causing delay in the passing of the head through the vulva. (2)

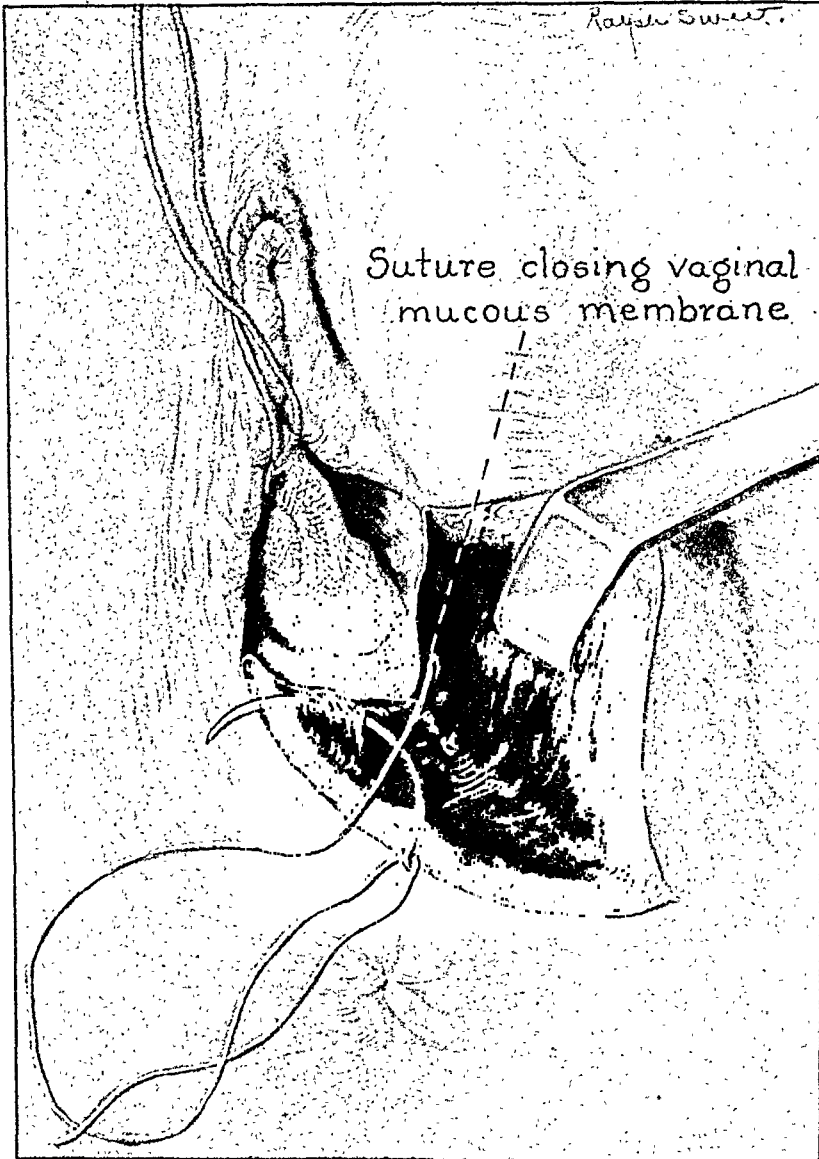


Fig. 2.—Wound retracted showing location of knot and suture in submucous tissue at upper angle of vaginal wound.

Syphilis. (3) Scars. (4) Anomalies of the vulva. (5) Abnormal size of the child. (6) Abnormal mechanism. (7) Disproportion between the size of the outlet and the head. (8) The necessity for rapid extraction when one cannot give the perineum time to dilate. (9) Beginning laceration.

There are three types of episiotomy: (1) The lateral or bilateral;

(2) the median, where the line lies in the raphe; (3) the mediolateral, recommended by Tarnier and practiced by DeLee.

The episiotomy may be simple or deep. In the simple procedure the

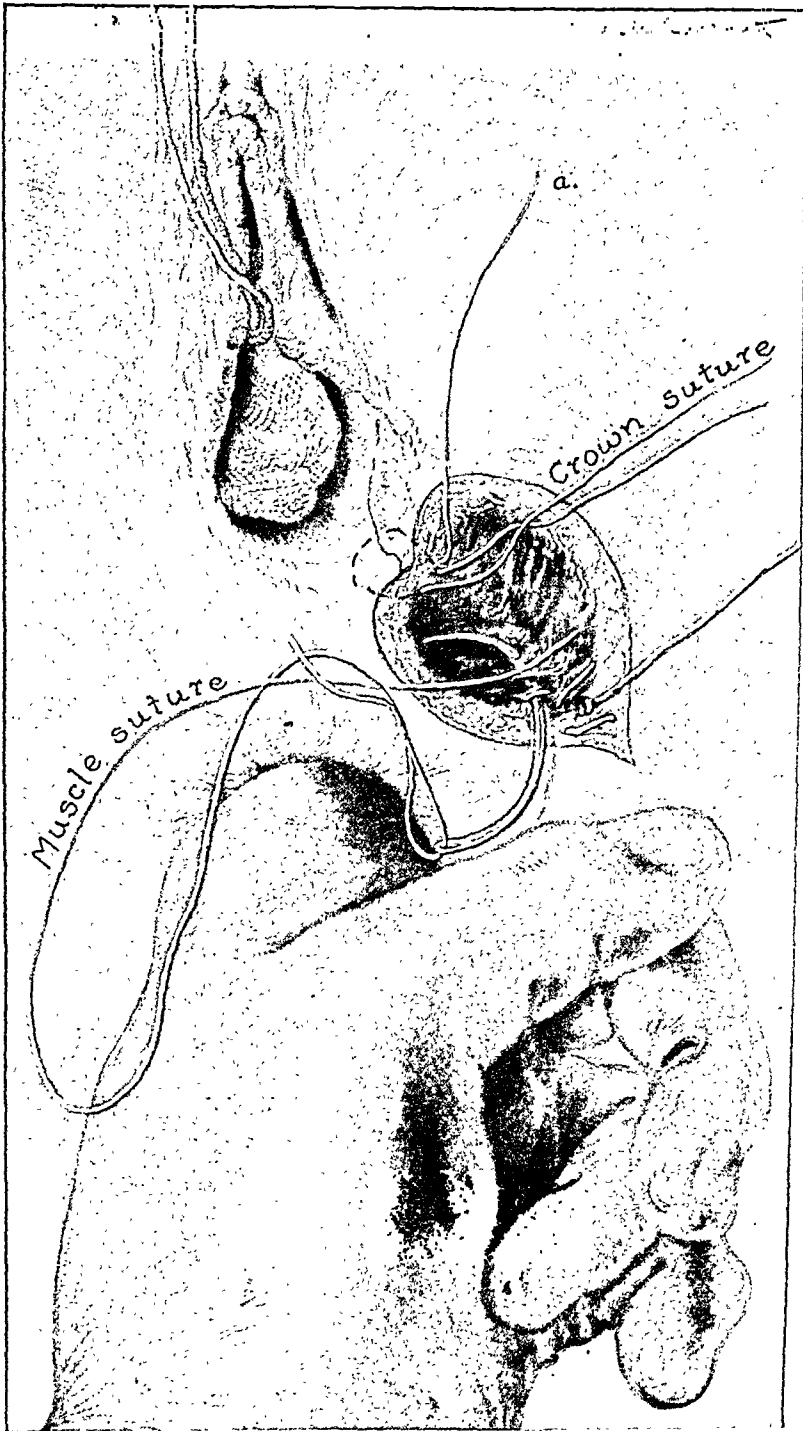


Fig. 3.—Mucous membrane closed. (a) Long end of suture left to tie with muscle suture; (b) crown suture completed and laid aside; (c) deep suture with long end left at lower end of wound.

following structures are cut: skin, urogenital septum, constrictor cunni and transversus perinei, and a few of the anterior fibers of the

puborectal portion of the levator ani. In the deep episiotomy, as recommended by Dührssen, the incision goes through the levator ani into the ischiorectal fossa, thus making an extensive operation. We are using the simple episiotomy as practiced by Tarnier and DeLee, because of the fact that there is less danger of an extension of the

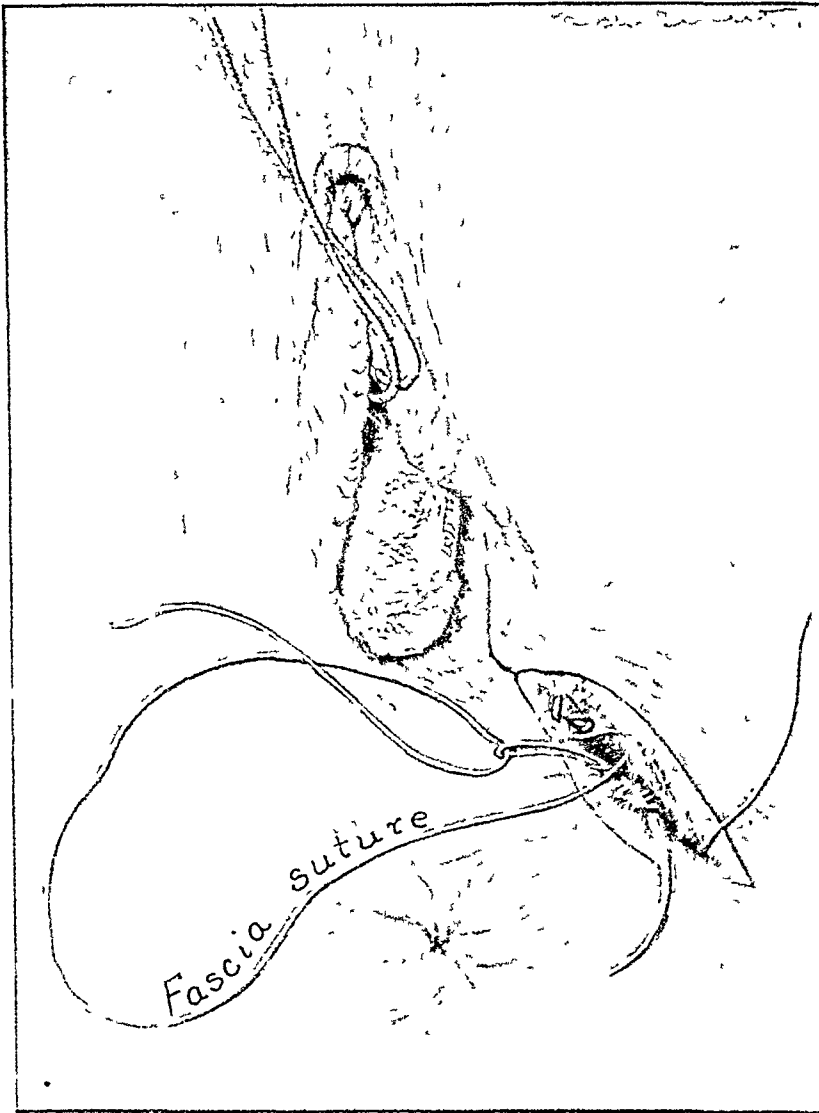


Fig. 4.—Deep tissues closed. (a) Knots tied to vaginal suture; (b) crown sutures tied with knots cut closely; (c) fascia suture beginning beneath and returning through opposite side to starting point and tied, continues to lower end of wound and ties to end of muscle suture.

wound. Another advantage is that the incision heals more readily because of the greater amount of muscular tissue.

It is well to wait until the levator ani muscles have been moderately stretched, as shown by the opening of the anus and the dislocation of the anus downward and forward, and only the resistance of the vulvar outlet remains to be overcome.

One blade of the scissors is placed on the vaginal mucous membrane, the other on the skin of the perineal body, midway between the anus

and tuberosity of the ischium, the cutting angle being at the raphe. With two fingers in the vagina and thumb on the skin, the sphincter is pressed out of the bite of the scissors. By a single closure of the scissor blades all of the intervening tissues are severed. Hemorrhage

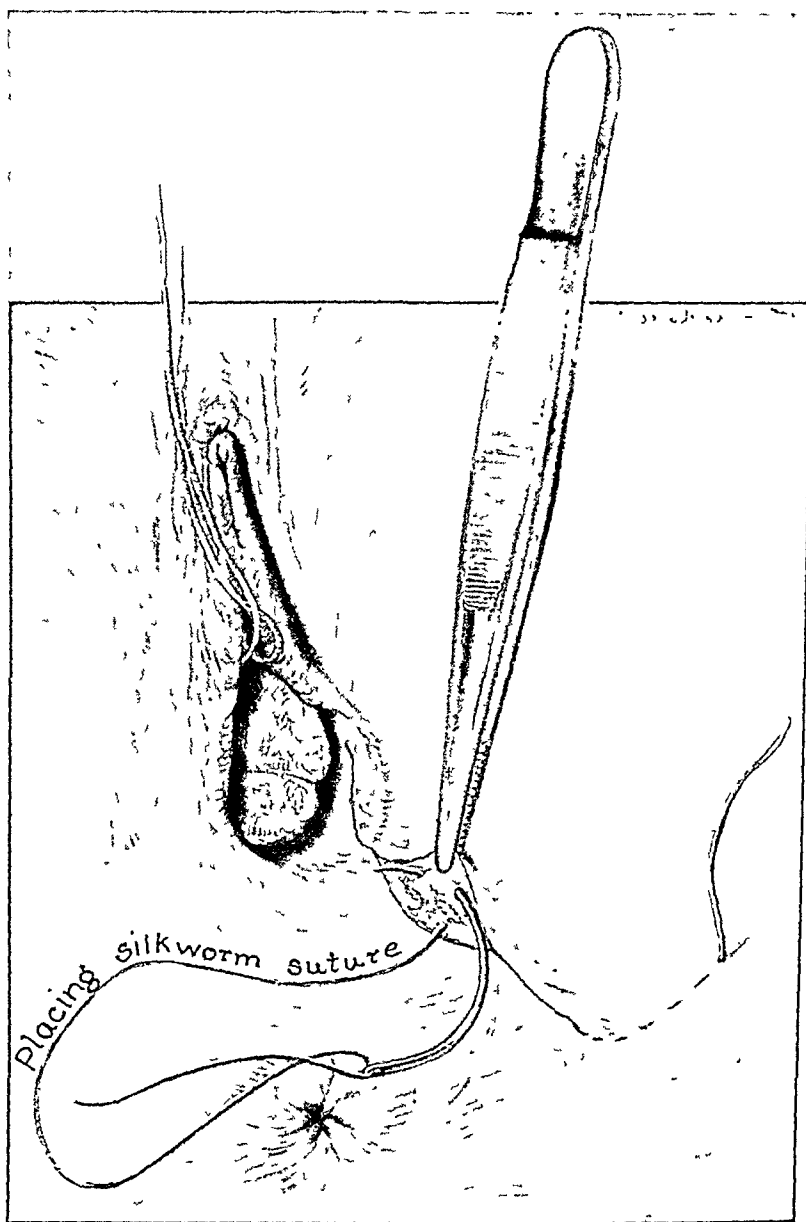


Fig. 5.—Closing skin with subcutaneous silk worm gut.

can be controlled by pressure and ceases entirely after the head has been delivered.

We now have a straight clean incision and can easily replace all structures in their correct anatomic relations.

With our early episiotomies some trouble was experienced from infection causing imperfect results. Observation led to the conclusion

that this contamination was due to infection following the sutures from the surface, at which points they were tied to the deeper structures. To obviate this objection the technic was modified, resulting in the method to be described. Since this modification, union by primary intention has always occurred and, after complete resolution, it is difficult to recognize one of these perineums as that of a woman who has borne a child.

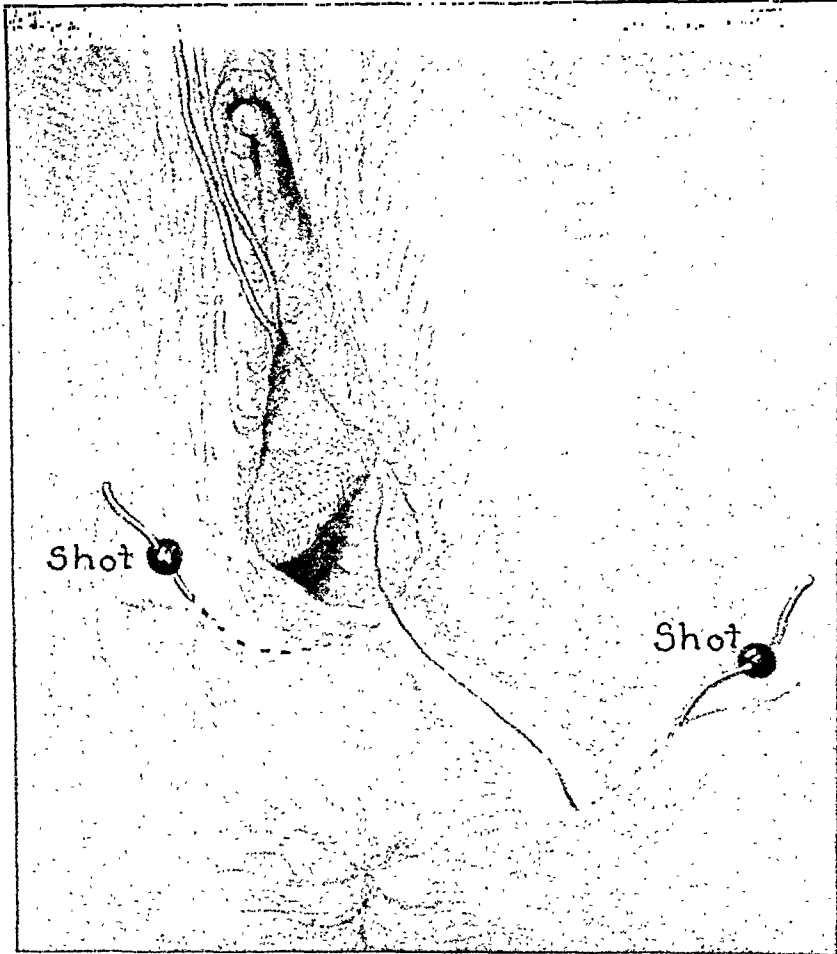


Fig. 6.—Wound closed with but two stitch holes in skin, but out of line of vaginal discharges.

Operation.—With the incision made as described, the repair is accomplished in the following manner:

1. Begin the catgut suture at the angle of the incision in the vagina, the bite including the submucous tissue only. Tie a knot underneath and use a continuous suture, taking great care not to puncture the mucous membrane. When the vaginal wound is closed with proper approximation of the tissues at the vaginal orifice, direct the suture down to the muscular tissue in the wound. Apply a clamp to the free end of the suture and leave it long enough to tie to the suture used to close the muscular layer.
2. Enter the crown suture beneath the fascia, passing upward and through it to the skin at the edge of the wound. By deep bites gather up the fibers of the constrictor cunnis and of the urogenital septum, the suture approximating the

corresponding structures on either side of the wound, but not puncturing the vaginal wall. The ends of this suture are clamped and laid aside until the muscle suture is completed and tied. Then it is tied and cut closely, the knot being later covered with fascia.

3. The index finger of the left hand should be in the rectum to determine the depth of the next suture. The deep suture should be started at the lower end of the wound. Tie the knot, leaving a long end to unite with the fascial suture. This should be a continuous suture, taking all of the severed tissues below the fascia, and going close to the rectal mucosa. When this suture is made tense, it approximates all of the muscular tissues. It should be tied to the long end of the vaginal suture and the ends cut closely.

4. The suture closing the fascia should begin at the upper end of the incision, starting under the fascia. It is brought through and over the fascia to the other side with the point of exit under the fascia near the point of entry and tied, drawing the fascia over the knot. This suture is continuous to the lower end of the wound. The end brought out beneath the fascia is tied to the muscle suture with the knot cut close. Thus we have mucous membrane, muscles, and fascia closed deeply, covering all sutures and knots.

5. The skin is closed with subcutaneous silkworm gut, the point of entrance being about one inch from the side of the wound, running to the lower end of the wound and making a subcutaneous suture to the vaginal orifice, then running beneath the skin to a point of exit about one inch upward and to the side of the vulva. The suture is pulled tight approximating the skin. A shot is put on each end about three-fourths of an inch from the skin. Thus the wound is closed with but two stitch holes in the skin and those are out of the line of vaginal discharge, thereby minimizing the probability of infection.

The wound should be healed in ten days, and there is but a single subcutaneous suture to remove. In six weeks all tissues will be as firmly united as before labor began.

For the past two years we have used this method of episiotomy and repair for almost every primipara. We have had no infections.

WOODLAND CLINIC.

RHYTHMIC VARIATIONS IN THE VASCULARITY OF THE UTERUS OF THE GUINEA PIG DURING THE ESTROUS CYCLE*

BY J. E. MARKEE, B.S., CHICAGO, ILL.

THE vascularity of the uterus of the guinea pig undergoes cyclic variations that make it appear to blush and blanch. Both the speed and the extent of these vascular changes are affected by the time of day and the stage of the estrous cycle. We have been unable to find similar vascular changes in any other tissue, either in situ or in transplants to the anterior chamber of the eye, of pancreas, islands of Langerhans, vas deferens, heart muscle, or liver.

These vascular changes were studied by three methods: First, by opening the abdominal cavity and studying the gross and microscopic changes in the uterus in situ; second, by transplanting a piece of endometrium to the anterior chamber of the eye by the method described by Dr. S. S. Schochet in *Surgery, Gynecology and Obstetrics*, in 1920, and third, by inserting a small tube through the vagina and half way up the horn of the uterus and observing the changes in the endometrium through that tube.

By the first method, namely, opening the abdominal cavity of an anesthetized guinea pig, we found that the whole uterus was red most of the time. About every minute a light area appeared at the upper end of the horns and spread down them toward the cervix. The whole uterus was white for ten or fifteen seconds and then the region above the cervix became red and the red color spread up the horns of the uterus. These changes occurred about once a minute during the diestrus and much more slowly during estrus. We were unable to observe them in immature animals. It is possible to make much more detailed observations on endometrium transplanted to the anterior chamber of the eye. Figs. 1 and 2 represent the two phases of an endometrial transplant in the anterior chamber of the eye of a guinea pig. The former represents the condition when the transplant is white; the latter the condition fifteen seconds later when it is red. By comparison with a Tallqvist hemoglobinometer we found that the two colors were comparable with the colors indicated by 0 and 50 per cent hemoglobin respectively.

We made twenty-minute records every two hours for three complete estrous cycles of sixteen days each. Two of the records were made on

*Read at a meeting of the Chicago Gynecological Society, April 20, 1928.

This research was conducted under a grant from the Douglas Smith Foundation for Medical Research of the University of Chicago.

one animal and one on another. Kymograph records were made of the color changes by means of a graduated dial and a muscle lever.

The first group of kymograph records illustrates the four typical phases of the vascular reaction seen every day of the estrous cycle except during estrus. The first record was taken in the early morning. The vascular changes occurred about every twenty seconds; the average color corresponded to 25 per cent hemoglobin and the transplant was completely blanched or white about 6 per cent of the total time. In the forenoon both the speed and the extent of the reactions are increased. At this time they recur about every fifteen seconds; the average color of the transplant is comparable to 30 to 35 per cent hemoglobin, and it is completely blanched about 10 per cent of the total time. From noon until 3 P.M. the speed and especially the extent of the vascular changes are greatly decreased. They recur about every eighteen or nineteen seconds. The time in complete blanch is less than 10 per cent of the total time, and the average color corresponds to 25 per cent hemoglobin. The height of the vascular



Fig. 1.



Fig. 2.

activity is reached in the late evening from about 8:00 until 11:30 P.M. The vascular cycles recur about every twelve or thirteen seconds. The amount of time in complete blanch is more than 12 per cent, and the average color is comparable to 35 per cent hemoglobin. These four phases—the lowest activity in the early morning, an increase in the forenoon, a slight decrease about noon and the height of the activity in the evening—are found throughout the cycle except during estrus. (Fig. 3.)

The second group of kymograph records (Fig. 4) illustrates the effect of estrus on these vascular changes. The first record illustrates the condition during proestrus. Two hours before this record was taken the vascular changes were recurring every thirteen seconds and the transplant was completely blanched 16 per cent of the total time. When this record was taken, the changes were recurring every twenty seconds, and the amount of time in complete blanch had dropped to about 8 per cent. There was a decrease of about 40 per cent in the vascular activity of the transplant during this two-hour period. At this time of day there would normally have been an increase. The

second record illustrates the condition during much of the estrus. This animal was in estrus, as determined by the vaginal smears and other methods, from 2 until 7 A.M. There were no vascular changes that compared in extent with those found at all other times in the estrous cycle. The color of the transplant for this five-hour period remained around 25 per cent, neither falling much below 20 per cent nor rising much above 35 per cent.

The third record illustrates the condition during postestrus. The vascular cycles reappear at this time, and there is a very rapid return to the condition found during the diestrum. However, the long plateaus at about 40 per cent hemoglobin are typical of this stage. The last record illustrates the height of activity reached during the dies-

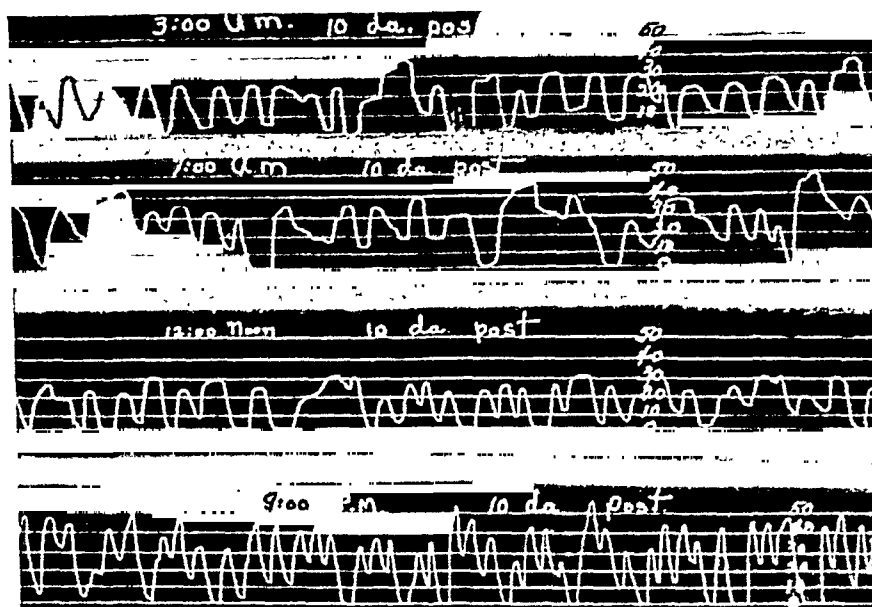


Fig. 3.

trum when the vascular reactions sometimes recur every twelve seconds; the average color of the transplant is above that of 35 per cent hemoglobin, and the transplant is completely blanched 16 per cent of the total time.

The small blood vessels in the transplant alone could be observed through a microscope and they appeared and disappeared about every fifteen seconds, while the blood vessels leading to the transplant as well as all the other visible vessels in the eye remained unchanged.

We have been unable to observe this phenomenon in well-vascularized transplants of uteri in immature animals.

By inserting a speculum 4 mm. in diameter through the vagina and half way up the horn of the uterus, we were able to confirm these findings in unanesthetized animals, since we found that the endometrium changed from red to white and back again every fifteen or twenty seconds during the diestrum but not during estrus.

These vascular changes seem to be a specific property of the uterus, for although we have observed them there by the three methods described, we have been unable to observe similar vascular changes either in any other tissue in situ or in transplants to the anterior chamber of the eye, of pancreas, islands of Langerhans, vas deferens, heart muscle or liver.

The facts briefly summarized are: These vascular changes are influenced by the time of day, being at their lowest ebb in the early morning, increasing both in speed and in extent in the forenoon, decreasing again about noon, and reaching their height late in the evening. They are also influenced by the stage of the estrous cycle, slowing during proestrus until they disappear completely for four or five hours, and then begin to reappear before the end of the period of heat.

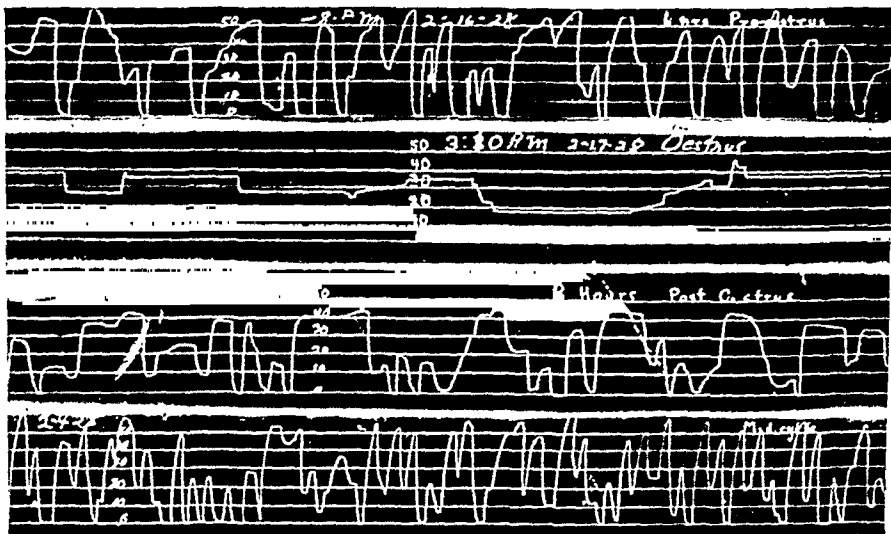


Fig. 4.

These gross changes are caused by great variations in the amount of blood in the capillaries and arterioles.

From these facts we conclude that these vascular changes are a phenomenon of the capillaries and arterioles of the uterus and especially of the mucous membrane.

The vaginal smear method as a test of the efficiency of the follicular hormones and other similar pharmacologic agents is based primarily on the changes in the vaginal epithelium. These changes are simply the expression of rapid growth and may be called forth by agents other than follicular hormones, some of which do not affect the uterus and ovaries. An attempt, therefore, to determine the applicability of this phenomenon as a criterion of the uterine efficiency of the sex hormones and other similar pharmacologic agents is now under way.

(For discussion, see page 268.)

THE PROGRESS OF TEACHING AND PRACTICE IN GYNECOLOGY DURING THE LAST FOUR DECADES*

BY BARTON COOKE HIRST, M.D., PHILADELPHIA, PA.

THE review of the progress of teaching and practice in gynecology during the last four decades is a large task. To survey all the achievements of this period in any branch of medicine would require years of work by a medical historian. My only qualification is to have lived in this era, and as an humble follower of William Osler in his advocacy of the peripatetic philosophy in medicine, not to have been blind to what I have seen.

It is not my intention to dwell on the lamentable ignorance of the past in the light of the present knowledge, a trait of the human mind older than Cicero, who commented on the wonder of each generation that its predecessor could be ignorant of what is so evident; a mental state conducive to a smug complacency with the present, but inimical to future progress. A more profitable undertaking is to contribute, no matter how little, to a future that shall be as superior to the present as the present is to the past.

In the latter spirit a retrospect of teaching and practice in this locality, a survey of the present and a glimpse into the future, might point the way to some of the improvements for which we should hope.

A description of practice and teaching forty years ago is familiar enough to men of my generation but it must sound strange to younger men. The women who went to hospitals for delivery were usually paupers and the illegitimately pregnant. There were few places for them to go. In this city (Philadelphia), Blockley, the Preston Retreat, the Lying-in Hospital, and the Maternity Hospital comprised the list; all small, none of them frequented by the well-to-do; in fact, a stigma attached to residence in them. Consequently, the delivery of a woman, a surgical procedure, was always conducted in her own home; difficult enough to do now with all our knowledge of asepsis and our transportable operative equipment, but doubly difficult then with the hazy notions about infection prevalent in the early antiseptic era and lack of equipment. High forceps operations were common; failing in that, version was the next procedure tried, with little regard to the relative size of head and pelvis, often with disastrous results. These operations were done with the patient on her bed, with no assistants. Cesarean section was such a rarity that throngs of spectators rushed to see it in a public clinic and it was considered so dangerous that patients were offered the choice between craniotomy on the living child and the

*Read before the Obstetrical Society of Philadelphia, December 1, 1927.

cesarean operation in cases of insuperably contracted pelvis. For this was the only indication for the operation in those days; no one considered its employment in placenta previa, toxemia and the other indications of today. The accepted technic of a cesarean section here at that time was of an incredible crudity; a huge abdominal incision; the evisceration of the unopened uterus, its evacuation, the transfixion of the lower uterine segment with a couple of skewers, the ligation en masse of the cervix and broad ligaments by a rubber tube, the amputation of the corpus uteri and the fixation of the stump, as large as one's wrist, in the lower angle of the abdominal wound, to slough away in the course of five or six weeks, invariably leaving a large incisional hernia if the woman survived the operation itself or the sepsis and secondary hemorrhage that frequently carried her off during convalescence. It was Baer, of this city and of this Society, who taught us to drop the cervical stump after hysterectomy, an important historical fact that should be remembered. We knew nothing of leucocytosis, differential blood counts, blood cultures, blood chemistry, the sedimentation test and blood pressure; nothing of hypercholesterolemia, responsible for the gall bladder complications of pregnancy; nothing of functional tests for kidneys and liver; of pyelitis, of the Wassermann reaction; of the intravenous treatment of syphilis, and of gestational toxemias. We did not yet possess the primitive cystoscope over the credit for which Kelly and Pawlik wrangled later. Endocrinology was as yet unborn. Bacteriology was in its infancy and was not utilized in diagnosis or treatment. Early gestational toxemia was a neurosis and late gestational toxemia, nephritis. Appendicitis was perityphilitis, treated by poultices and opium. Salpingitis was parametritis, treated by iodine to the vaginal vault and tampons. I heard the late Professor Goodell, in a meeting of this Society, say that he never saw a pus tube and that he did not believe there was such a thing. We knew nothing of the refinements of aseptic technic in pelvic examinations and manipulations, with which we are now familiar. We knew none of the methods of precision in the diagnosis of pregnancy, none of the specific treatments for blood infections. We had no radium or x-rays. Antisepsis, in gynecic surgery, if attempted at all was Listerism with its carbolic spray and occlusive dressings to exclude the air. For disinfection of the birth canal, corrosive sublimate was the remedy. Cleansing of the hands was neglected and rubber gloves were unknown. When I went to my professor of clinical surgery in great distress of mind about the dreadful infections in the surgical ward of the University Hospital, I was told that I had no more to do with them than I had with the next thunderstorm above the city; that these infections all came from the air; so I continued with a clear conscience to infect everything I touched and to shovel out of

the bran dressings of open wounds live maggots that had bred overnight.

If a young physician were suddenly thrust backward forty years, one of his strangest experiences would be to miss so many names with which we are familiar in our branch of medicine. There was no Stroganoff to systematize the use of morphia in eclampsia; no Watkins to show us how to cure a cystocele; no Wertheim to teach us how to do a panhysterectomy for cancer; no Potter to improve the technic of version and to enlarge its indications; no Rubin's test for patency of the tubes; no Titus or Thalheimer to demonstrate the advantages of the intravenous treatment of the toxemia of pregnancy with glucose and insulin; no Kielland, Barton or Piper with their new models of forceps.

So much for a brief review of the practice of the day that was necessarily a reflection of the teaching of the time. To enter the medical school a page of English composition was required, nothing more. The farmer's boy could drop his plough, the conductor leave the platform of his street car, the mechanic desert his trade and enter a medical school. No wonder the manners of our medical students were not exactly Chesterfieldian. Our medical course had recently been increased to three years. The last two years we heard the same lectures repeated. The course ended, as I remember, somewhere about the middle of February, and we graduated in March. For the care of women and their infants in childbirth, the most responsible duty demanded of a young physician, we had no training at all; nothing but didactic lectures, inimitable, it is true, as given by Professor Penrose, but entirely inadequate to fit anyone for the emergencies of that branch of medicine.

It was in Europe, eighteen months after my graduation, that I first took care of a woman in labor. It was the first day of my internship in the Royal Frauen Klinik in Munich. I was demonstrating the management of labor to German medical students, many of whom had a greater experience than I, and the head nurse serving under my direction had, as a midwife, delivered eight thousand women.

In what is carelessly and incorrectly called gynecology our instruction was better. We watched Goodell operate both in large clinics, in which we saw practically nothing, and in small ward classes, in which we saw plastic operations, such as they were, and were given an opportunity to make a few vaginal examinations. The effect of our theoretical teaching, mainly by lectures, was illustrated by an incident of which Goodell told me privately. A young graduate called on him one day to ask him how he removed ovaries, many women being spayed in those days for indications that would not now be justifiable. Goodell good naturedly described the technic of oophorectomy, but then in alarm said, "You do not propose to operate on this verbal descrip-

tion?" "Oh, yes, I do," replied the young man. Meeting him some time later Goodell asked how the operation had prospered. "I did exactly as you told me, but unfortunately forgot one step in the technique. I neglected to ligate the blood vessels."

And here let me digress for a moment by an incursion into etymology, to explain a recent phrase in this manuscript about the careless and incorrect use of the word gynecology, and to point out the disadvantages we labor under in maintaining a provincialism in teaching, study, and practice of this subject, commented upon with surprise and evident disapproval by every foreign visitor. In response to Juliet's query, "What's in a name?" a physician might answer, there may be life and death in it; there may be clear thinking or mental confusion; there may be progress or retrogression in it. Hundreds of lives have been lost in consequence of the careless use of the word curettage to denote the instrumental evacuation of the uterus after childbirth or abortion. Gynecology means the study of everything peculiar to women, whose sole biologic purpose in life is reproduction. The chief item in this study therefore must be the act of reproduction with all its consequences, anomalies and complications, which include all the diseases of women. To usurp this term gynecology, therefore, for a minor branch of the subject, mere gynecopathy, is to give the latter undue importance and to confuse both the professional and lay mind. If gynecology were only gynecopathy, the surgeon's taunt that such a specialty is unnecessary, would be justified. Why not agree on a correct nomenclature, not a fanciful *lucus a non lucendo*, but the clear expression of a true idea? Gynecology includes its major subject, genematology, the science of reproduction, and its minor subject, gynecopathy, the study of the diseases which are the results or the complications of childbearing. Neither one of the two branches of gynecology can be studied, taught or practiced successfully without the closest correlation with the other. Of this, however, more later.

Now as to our comparative position in those early days. In comparison with Europe we were woefully deficient. Any one going from our medical schools to the best of those in Europe was astonished and humiliated. The instruction of medical students was then better there in some ways than it is here now. The primitive conditions here however were not surprising. We were only some two hundred years removed from the log cabin stage of civilization and many parts of the country were just emerging from it. Europe had the start of us by more than a thousand years. The marvel of it is that in a generation we have attained in some respects an equality with Europe, in a few, even a superiority.

In contrast with other parts of this country our position needed no apology. The Medical Faculty of the University of Pennsylvania forty years ago was the strongest in its history, composed of really

great figures in our medical world. The medical education, poor as it was, was the best to be had in America. The Medical School here was at the peak of its reputation and influence. Pepper, Agnew, Goodell, Wormley, Ashurst, Leidy and their colleagues were keenly aware of the restrictions imposed upon them by lack of equipment, poverty of means, the impracticability of advancing faster than the country would follow. The great mind of William Pepper, without an equal in this city, I think, since the days of Franklin, had the vision and the compelling energy to lay the foundation of the advantages we enjoy today.

What now of our present and of the immediate future? We tread here on delicate ground.

For many years this city had the unchallenged hegemony in the teaching of "gynecology," to be consistent in the etymologic reform just advocated. Shippen, James, Dewees, Hodge and Meigs were without rivals in their time. But this very supremacy engendered too great a confidence in what appeared to be an unassailable position. Shippen, in 1765, founded the first maternity hospital in North America for the practical instruction of medical students. James conducted classes in the Philadelphia Hospital, but their successors became more and more indifferent to the necessity of practical training so that many years had elapsed before the induction of the last incumbent of the chair, without a bed or a patient; with no training in that branch of medicine that is as much if not more of an art than any other and is unsurpassed by any other in its importance to the individual, the family, and the State. Meanwhile, other places had awakened to the defects of our medical education. New York was given the Sloane Maternity for the instruction of the students of the College of Physicians and Surgeons. Boston had its Lying-in Hospital for the Harvard students. Baltimore had its Woman's Hospital for medical students. There may have been other institutions of the same kind elsewhere of which I am not aware. The University of Pennsylvania had its first beginning of a maternity hospital in a ridiculously inadequate little pavilion with five beds, which the professor at that time had to pay for out of his own pocket. This was thirty-eight years ago. Since then, throughout the country, the progress has been prodigious, a progress in which we have shared to a modest degree. Let the facts speak for themselves: Montreal has a unit for gynecology, that is, a woman's hospital for both the major and minor branches of the subject, under one head, with two hundred and forty beds, erected at a cost of \$1,600,000. Columbia University is incorporating the Sloane Hospital for Women in that stupendous mass of buildings on the banks of the Hudson in New York City. This institution is also organized on modern principles, accepted now almost everywhere in this country as they always have been in Europe. Announcement has just been made of a new medical center in New

York City on the East River, next to the Rockefeller Institute, for which millions of dollars are promised. A rival to the Sloane Hospital will unquestionably be incorporated in these buildings. Professor Bill of Cleveland is at the head of a Woman's Hospital in that city. Professor Peterson of Ann Arbor is recently housed in a similar unit. Professor Polak of Brooklyn has ample accommodations for teaching both branches of gynecology. The Johns Hopkins Woman's Hospital has been in operation for some years. Chicago had set aside a city block across the street from its new medical buildings for a Woman's Hospital under one head. Even smaller cities, with no medical schools, are building splendid maternities. There is a new Maternity Hospital in Providence, R. I., costing over \$900,000.

To be classed in the first rank today a medical center must have an equipment second to none in buildings, organization and clinical material; a balanced state of mind in the directorate, supple enough to keep abreast of modern medical progress, keen enough not to chase the *ignis fatuus* of some vagary masquerading as progress, and above all without a reactionary tendency that balks at advancement because it is an innovation.

These few remarks on local medical history, our present position and future prospects may sound pessimistic. They are not meant to be. No one could know the younger generation to whom we hand the torch of medical enlightenment and progress, without confidence that they will have a wider vision, greater attainment than ours. That these thoughts were prompted by discontent is true, a feeling with which I would imbue all here; not the discontent ending in captious criticism, but the "divine discontent" of which Charles Kingsley spoke that incites one to greater accomplishment.

In conclusion a word about our venerable Society, without which a history of the last four decades of gynecology in Philadelphia would be incomplete indeed. Founded at a meeting in June, 1868, it numbered among its original members such names as Robert Harris, Albert H. Smith, George Pepper, Ellwood Wilson, Wallace, D. Hayes Agnew, Duer and Parry.

The famous debate between Goodell and Ellwood Wilson on the relative merits of version and forceps; Goodell's paper on concealed accidental hemorrhage of the gravid uterus, the basis of all subsequent study of the subject; his description of chorea complicating pregnancy; the fiery onslaught of Joseph Price on some of the mistaken practices and beliefs of his day turned the eyes of the whole profession toward our meetings. I wish we could claim the honor of incorporating in our transactions Goodell's sketch of Louyse Bourgois, a literary gem of the first water; the most charming bit of English ever written by an American physician with its exuberant wit and rollicking humor, its facility and originality of expression, its profound knowledge

of history and literature. But we must relinquish this distinction to the County Medical Society.

If the transactions of late years do not command the attention they once did it is because, in the absence of revolutionary changes or discoveries that are not likely today or in the near future, we have perhaps busied ourself with minor details and none of us have the pioneer's enthusiasm of our predecessors. But much remains to be done in literary, clinical, and laboratory research, in animal experimentation, in the careful correlation of known facts, in compiling statistics according to a well-considered, generally accepted plan and in the study of comparative genematology.

If we possessed a center for this work at least the equal of anything of its kind in America, and equally well organized, there would be a stimulus to investigation by which our society would again become the vehicle for conveying information of great value to the whole medical world, giving to its transactions a rank commensurate with its past reputation.

POSTPARTUM BLADDER COMPLICATIONS

BY GEORGE C. PRATHER, M.D., BOSTON, MASS.

THE postpartum bladder occasionally shows the effects of the efforts and accomplishments of the uterus. It has been acutely compressed during late pregnancy; its attachments have been markedly stretched by uterine enlargement. Recovery from such rough handling sometimes takes longer than what we consider as normal. Such cases form our group of postpartum bladder complications.

The conditions which primarily concern us are (1) acute retention of urine, and (2) bladder residual in those who are voiding apparently normally. Bladder residual urine is determined by catheterization immediately after the patient voids, measuring the amount of urine obtained. Acute retention is self-evident. Acute cystitis may accompany either of the two conditions just mentioned. It will also be discussed.

Recognition of such complications as well as the admission of the possibility of occasionally overlooking such conditions was admirably stated by Chamberlain¹ in 1877. He said, "This form of cystitis is very common * * *. I believe I have often overlooked it, confounding its subjective symptoms with afterpains, its tender hypogastric tumor with a sensitive uterus, its turbid urine with urine contaminated by lochial admixture or vaginal secretions. Rarely is there a painless hyperdistention of the bladder to such an extent that we might suppose meteorism was present, did not the fluctuating tumor

soft but dull on percussion, and the *stilllicidum urinae*, but especially the catheter readily conduct us to the true diagnosis."

As Chamberlain wrote fifty years ago, so today postpartum bladder complications are occasionally overlooked. Cases of unexplained puerperal temperatures, cases which are diagnosed questionable pelvic sepsis, will frequently be found carrying a bladder residual which is definitely responsible for the fever. It is this group especially which has been interesting from the standpoint of diagnosis and treatment.

The study upon which this paper is based includes 58 postpartum cases from the Urological Service of the Boston Lying-In Hospital, observed during the years 1925, 1926, and 1927, which required treatment of the bladder for two or more consecutive days.

Fifty-eight cases comprise 1.1 per cent of the number of deliveries at the hospital during that period. Of these 58 patients, 87.6 per cent were primiparae. A history of previous trouble with the urinary tract was obtained in only 6.9 per cent. The average length of labor was twenty and a half hours. The types of delivery were given as follows:

Normal	9	15.52 per cent
Low Forceps	24	41.39 "
Mid Forceps	9	15.52 "
High Forceps	4	6.89 "
Breech	5	8.62 "
Internal Podalic Version	4	6.89 "
Cesarean	3	5.15 "
	<hr/> 58	<hr/> 100.00 per cent

Perineal tears were listed as follows:

No tear	13	22.42 per cent
First degree	13	22.42 "
Episiotomy or second degree	32	55.16 "
	<hr/> 58	<hr/> 100.00 per cent

From a study of the records, it does not seem likely that any one type of delivery is responsible for bladder complications, or that perineal lacerations play any part as causative factors.

ACUTE RETENTION

In a series of 157 puerperal cases, Taussig² found that 3.8 per cent required catheterization for acute retention. He quotes cystoscopic studies of acute retention bladders by Stoeckel and Ruge who found definite edema around the internal sphincter. Shutter³ quotes further studies by Ruge who concluded that postpartum bladder difficulties were in direct proportion to the amount and severity of injury to the bladder wall at delivery. Schmitz⁴ and others have found that during

pregnancy and the puerperium, the bladder has an increased capacity and is not as sensitive to a definite amount of urine or fluid as in the nonpregnant.

One seems justified from the facts known today in believing that no single factor is responsible for acute retention in these cases. Injury to the bladder wall from pressure or stretching of adjacent tissues, the paralyzing effect of the anesthesia, the increased bladder capacity, and the temporarily disturbed function of the nerves to the bladder as the result of delivery are probably the principal factors.

There are 39 cases of acute retention in this series, forming 67.24 per cent of the bladder complications. Data for this group are tabulated in Tables I, II, and III. The acute retention was relieved by catheterization. The smallest amount of urine obtained at initial catheterization was 10 ounces, the largest amount 69 ounces, or an average of 32 ounces.

Of these 39 cases with acute retention, 24 or 61 per cent had temperatures above 99° before catheterization was done, the highest being 101°. Of the 24 with temperature, 13 had had sediment examination of a catheter specimen, 9 of which were normal, 4 containing a moderate number to many W.B.C. Of the 14 cases of acute retention with normal temperature 9 cases had had examination of the urinary sediment, all of which were negative.

We may say that acute retention with rise in temperature before treatment may or may not show evidence of infection in the urinary sediment. In this group all cases of acute retention without rise in temperature before treatment had normal urinary sediments.

Two types of treatment were used in this series; namely, intermittent drainage, and constant drainage. In all these cases suprapubic and perineal heat, pituitrin or benzyl benzoate had failed to induce urination. The instillation of air, borated glycerin, and other mild irritants into the bladder have been employed by others without promising results in acute retention, and were not used in this series of cases.

Intermittent drainage was accomplished by catheterization every eight hours until the patient began voiding in satisfactory amounts. From that time catheterization for residual was done twice each twenty-four hours until the residual was found to be less than 1½ ounces. Catheterization was done aseptically and followed by a bladder irrigation with warm boric acid solution.

For constant drainage, a self-retaining catheter, size 18 or 20 F., was inserted into the bladder with a stylet. Bladder irrigations with warm boric acid solution were done once per day. Constant drainage was maintained usually until after the patient's temperature had been normal for twenty-four hours, and for a period sufficient for the bladder to regain its tone. Within twenty-four hours after the re-

TABLE II. ACUTE RETENTION. TREATMENT: CONSTANT DRAINAGE

CASE NO.	AMOUNT RESIDUAL OZ.	TEMPERATURE BEFORE TREATMENT	NUMBER OF DAYS OF TREATMENT	HIGHEST TEMPERATURE DURING TREATMENT	NUMBER DAYS		URINE SEDIMENT BEFORE TREATMENT	URINE SEDIMENT DURING TREATMENT	COMPLICATIONS
					TREATMENT	NORMAL			
1	35382	16	100	104	3	negative	many W.B.C.	many W.B.C.	none
2	37038	14	994	992	4	many W.B.C.	many W.B.C.	many W.B.C.	none
3	38086	18	992	1026	4	many W.B.C.	15 W.B.C.	W.B.C.	none
4	38237	58	1006	1004	11	?	?	?	none
5	36578	16	986	1008	10	negative	many W.B.C.	many W.B.C.	none
6	37854	64	986	1002	8	negative	many W.B.C.	many W.B.C.	none
7	37961	?	986	1008	13	negative	many W.B.C.	many W.B.C.	Uterine sepsis
Uncomplicated Cases: Average number days of treatment					6.5				
Average number days before temperature normal					6.06				

TABLE III. ACUTE RETENTION. TREATMENT: INTERMITTENT AND CONSTANT DRAINAGE

CASE NO.	AMOUNT RESIDUAL OZ.	TEMPERA- TURE BEFORE TREAT- MENT	INTERMITTENT DRAINAGE		CONSTANT DRAINAGE		NUMBER DAYS TREAT- MENT BEFORE NORMAL TEMPERA- TURE	URINE SEDIMENT BEFORE TREATMENT	URINE SEDIMENT DURING TREATMENT	COMPLICATIONS
			NUMBER DAYS	HIGHEST TEMPERA- TURE	NUMBER DAYS	HIGHEST TEMPERA- TURE				
1	34758	61	98 ⁶	5	100 ⁸	5	99 ⁸	9	negative	none
2	34846	27	101	4	101 ⁴	6	100 ⁴	7	moderate no.	
3	34991	?	100	5	101 ²	7	100 ²	10	W.B.C.	many W.B.C.
4	36562	62	100 ²	3	102 ⁶	2	99 ⁶	7	negative	few W.B.C.
5	36665	?	99 ²	3	100 ²	5	99 ⁶	5	negative	many W.B.C.
6	36794	42	98 ⁶	5	100	4	99 ⁶	6	?	many W.B.C.
7	36911	?	101	3	100 ⁴	5	100 ²	7	?	?
8	37461	50	98 ⁶	4	100 ⁸	10	99 ⁶	14	many W.B.C.	many W.B.C.
9	37540	?	99 ²	4	98 ⁶	6	99 ⁴	10	?	many W.B.C.
10	38194	22	?	2	98 ⁶	2	99 ⁶	4	negative	few W.B.C.
11	38202	10	99 ⁴	1	100 ⁴	7	101	10	negative	?
12	38360	44	99 ⁴	1	99 ²	6	101 ⁴	8	?	?
13	38638	69	99 ⁶	3	101	4	101	7	?	?
14	33776	?	100 ⁴	7	104	5	105	15	?	?
15	34357	?	?	4	105	6	103	28	?	?
16	37230	28	98 ⁴	4	104	8	104 ²	9	negative	many W.B.C.
17	36735	16	98 ⁶	3	100	÷	?	?	3-5 W.B.C.	40 W.B.C.
Uncomplicated Cases:										
Average number			days	intermittent drainage			3.07			
Average number			days	constant drainage			5.3			
Average number			days	before temperature normal			8.			

removal of the catheter, the bladder residual was measured and if more than $1\frac{1}{2}$ ounces were obtained, constant drainage was again instituted. This form of bladder treatment is very comfortable and much less annoying than frequent catheterization.

The number of days of treatment in all the cases may be taken as the time necessary for the bladder to regain its ability to empty itself, as treatment was not discontinued until a residual of less than $1\frac{1}{2}$ ounces was demonstrated immediately after voiding. The time for constant drainage may be slightly longer than actually necessary, due to the inadvisability of removing the catheter daily, testing for residual, and perhaps finding it advisable to replace it.

Exclusive of complicated cases, the average number of days of treatment by intermittent drainage alone (Table I) was 5.33 days compared with 6.5 days by constant drainage alone (Table II). The average number of days before temperature remained below 99.2° , was the same under each method, namely, 6.6 days.

As shown in Table III, 17 cases were treated by intermittent drainage from 1 to 5 days, then put on constant drainage until relieved. Such a change was not anticipated when intermittent drainage was begun, but was done either because the temperature was higher than desired, or, the bladder residual was not decreasing satisfactorily. In this group, the average length of the combined treatment was 8.1 days. Eight days were required before the temperature remained normal (Table III).

There were 5 cases of postpartum pyelitis which complicated these 39 cases of acute retention, 12.8 per cent. This of course is much higher than the average incidence of postpartum pyelitis. One case occurred with intermittent drainage alone. The four pyelitis cases in Table III began the pyelitis while the patient was on intermittent drainage treatment. It should be noted that in this group of acute retention cases, no upper urinary complications arose with a patient on constant drainage.

NONACUTE RETENTION WITH BLADDER RESIDUAL

Residual bladder urine during pregnancy and puerperium in patients voiding ordinary amounts has been recognized for some time. In contrast to postpartum cases we have seldom found a bladder residual of more than $\frac{1}{2}$ ounce during pregnancy, although Stevens and Arthur⁵ reported $33\frac{1}{3}$ per cent of pregnant women carrying bladder residuals. Curtis⁶ has found bladder residuals in 64 per cent of postpartum cases after the return of spontaneous voiding.

Holsteks' work, quoted by Shutter,³ refers to 30 unselected postpartum cases who were catheterized daily for one week after delivery. The average residual one day after delivery was 107 c.c. for primiparae, 58 c.c. for multiparae. One week later the average residual was 14 c.c.

TABLE IV. NONACUTE RETENTION. TREATMENT: INTERMITTENT DRAINAGE

CASE NO.	AMOUNT RESIDUAL OZ.	TEMPERATURE BEFORE TREATMENT	NUMBER OF DAYS OF TREATMENT	HIGHEST TEMPERATURE DURING TREATMENT	NUMBER DAYS TREATMENT BE- FORE NORMAL	URINE SEDIMENT BEFORE TREATMENT	URINE SEDIMENT DURING TREATMENT	COMPLICATIONS
1	36198	101 ²	2	101 ²	1	few W.B.C.	few W.B.C.	none
2	36323	101	2	101	3	few W.B.C.	few W.B.C.	none
3	38031	101	4	100 ⁶	13	many W.B.C.	few W.B.C.	none
4	32943	100 ⁸	11	101 ⁶	5	negative	negative	none
Uncomplicated Cases: Average number days of treatment					4.86			
Average number days until temperature normal					5.5			

TABLE V. NONACUTE RETENTION. TREATMENT: CONSTANT DRAINAGE

CASE NO.	AMOUNT RESIDUAL OZ.	TEMPERATURE BEFORE TREATMENT	NUMBER OF DAYS OF TREATMENT	HIGHEST TEMPERATURE DURING TREATMENT	NUMBER DAYS TREATMENT BE- FORE NORMAL	URINE SEDIMENT BEFORE TREATMENT	URINE SEDIMENT DURING TREATMENT	COMPLICATIONS
1	35034	102	4	98 ⁴	1	negative	many W.B.C.	none
2	35585	102	4	102 ²	2	many W.B.C.	many W.B.C.	none
3	37792	101	2	99 ⁴	1	negative	many W.B.C.	none
4	37703	101 ⁸	4	100	1	many W.B.C.	few W.B.C.	none
5	38088	103	3	101 ⁴	3	few W.B.C.	?	none
6	38166	100 ⁶	3	100	1	negative	negative	none
7	39029	102 ⁴	3	102	5	negative	few W.B.C.	none
8	35661	105	13	103	17	negative	many W.B.C.	Rt. pyelitis— clinically
9	38174	104	20	?	24	negative	many W.B.C.	Rt. pyelitis— cystoscopically
Uncomplicated Cases: Average number days of treatment					3.28			
Average number days until temperature normal					2.			

TABLE VI. NONACUTE RETENTION. TREATMENT: INTERMITTENT AND CONSTANT DRAINAGE

CASE NO.	AMOUNT RESIDUAL OZ.	TEMPERATURE BEFORE TREATMENT	INTERMITTENT DRAINAGE		CONSTANT DRAINAGE		NUMBER DAYS TREATMENT BEFORE NORMAL TEMPERATURE		URINE SEDIMENT BEFORE TREATMENT		URINE SEDIMENT DURING TREATMENT		COMPLICATIONS
			NUMBER DAYS	HIGHEST TEMPERATURE	NUMBER DAYS	HIGHEST TEMPERATURE							
1	35158	99 ^a	3	100 ¹	4	100	7	negative	many	W.B.C.	many	W.B.C.	none
2	35168	100	2	102 ¹	4	101	6	?	few	W.B.C.	few	W.B.C.	none
3	35895	101	2	101 ⁶	4	101	5	many	many	W.B.C.	many	W.B.C.	none
4	36398	99 ^s	2	99 ²	6	100	5	?	many	W.B.C.	many	W.B.C.	none
5	32781	102	3	100 ⁸	3	99	4	many	many	W.B.C.	many	W.B.C.	none
6	32697	99	3	103 ⁶	9	104	8	many	many	W.B.C.	many	W.B.C.	Bilateral pyelitis cystoscopically

Uncomplicated Cases: Average number days intermittent drainage 2.4
 Average number days constant drainage 4.2
 Average number days before temperature normal 5.4

in primipara, and 7.5 c.c. in multiparae. Factors responsible for these residuals are no doubt similar to factors already mentioned as responsible for acute retention.

Patients with postpartum bladder residuals often refer to suprapubic or perineal discomfort, frequent urination, dysuria, or a feeling of not having emptied the bladder. Frequently they void in small amounts. In a number of cases the residual will be of sufficient quantity to give a palpable bladder. Occasionally it is difficult to differentiate by palpation between the bladder and a subinvolved uterus. The bladder is usually distinctly softer, with a less sharply defined upper margin, and is flat to percussion. Catheterization will either confirm or deny ones opinion concerning the mass.

Nineteen cases in this group, 32.76 per cent of the bladder complications did not have acute retention but had bladder residuals varying from 3 to 66 ounces. The average residual was 28 ounces. These cases are tabulated in Tables IV, V, and VI. All of these patients had temperatures over 99°, the highest in the otherwise uncomplicated cases being 103°. Temperatures of 100° to 102° were common. In these cases, no other cause for temperature could be found. Urinary sediments before treatment were normal in 7, showed a moderate number to many W.B.C. in 8, 4 not examined. Bladder residual as a cause of postpartum temperature is well worth keeping in mind.

The intermittent drainage cases averaged 4.86 days of treatment against 3.28 days for the cases treated with constant drainage. An average of 5.5 days were necessary to reach essentially normal temperature in cases treated with intermittent drainage, in contrast to only two days in those treated with constant drainage (Tables IV and V).

Table VI shows 6 cases in which intermittent drainage was begun but later changed to constant drainage. The reasons for changing were the same as given above for Table III. Average length of treatment was 6.6 days, requiring an average of 5.4 days for temperature to reach and remain normal.

There were 3 cases of postpartum pyelitis complicating these 19 cases, 15 per cent, again much higher than the average incidence of postpartum pyelitis. Two cases occurred in patients on constant drainage, one case on intermittent drainage. In all the 58 cases here tabulated, there were 8 cases of postpartum pyelitis, 6 of which occurred with intermittent drainage, 2 with constant drainage. We believe that acute retention or a bladder residual in the postpartum cases is conducive to pyelitis.

The catheter plays such a dominating part in the diagnosis and treatment of these conditions that its frequent use must be justified. In the past the catheter has been held responsible for cystitis following acute retention. There is sufficient evidence to change such an opinion as to the cause of so-called "catheter cystitis." Introduction

of bacteria into a normal bladder does not cause infection. Curtis⁷ has long maintained that residual urine proves favorable for bacterial growth and was the most important factor in this type of cystitis. Cabot⁸ believes that the tissues of the distended bladder wall become devitalized from pressure and interference with the venous return. Such tissue is much less resistant to bacterial invasion and offers a fertile field for growth. Distention of the bladder may cause small lacerations in the mucosa and permit a bacterial entry.⁹ These factors combined with the congestion following relief of the retention furnish grounds to absolve the catheter as the cause of cystitis in such cases. Bladder infection would probably be reduced if catheterization were not postponed to the point of an overdistended bladder. The proper and timely use of the catheter will decrease the incidence in this type of cystitis rather than cause it.

While the follow-up work on the 1925-26 cases has not been entirely satisfactory, there are a sufficient number of cases to believe that after these postpartum bladders begin to empty themselves, the urine sediment which perhaps showed pus either before or during treatment becomes negative within two months.

In determining the value of a certain treatment for postpartum bladders, the following points must be considered: (1) speed in getting the bladder capable of emptying itself, (2) effective reduction of temperature, (3) negative urine as soon as possible, (4) avoidance of upper urinary complications.

It is our opinion that constant drainage accomplishes these results more effectively in the nonacute retention cases which carry bladder residuals than does intermittent drainage, as shown in Tables IV and V. This form of treatment is recommended in such cases. In cases of acute retention, constant drainage has not brought an existing temperature down more rapidly than intermittent drainage and in this series its use has been necessary slightly longer to relieve the bladder residual. However, postpartum pyelitis occurred less frequently in the constant drainage cases. For acute retention, intermittent drainage as outlined is advised, instituting constant drainage at the end of forty-eight hours, if there still exists a bladder residual, or elevated temperature which seems due to the urinary complication.

I wish to express my appreciation to Dr. E. G. Crabtree who first advised the use of constant bladder drainage in this clinic, to Dr. F. S. Newell, and to the Residents and House Officers for their cooperation in this study.

CONCLUSIONS

1. Postpartum bladder complications are sometimes overlooked.
2. Unexplained postpartum fever may be due to bladder residual.
3. Of the bladder complications 87.6 per cent occur in primiparae.
4. No one type of delivery is responsible.

5. Injury to bladder wall at delivery, increased bladder capacity, and temporarily disturbed function of nerves to the bladder are believed to be responsible.

6. Treatment advised for acute retention is intermittent drainage as outlined, changing to constant drainage after forty-eight hours if there is still a bladder residual over $1\frac{1}{2}$ ounces, or a fever otherwise not explained.

7. Treatment advised for nonacute retention bladders having a residual is immediate constant drainage.

8. Cystitis in such cases is due to residual urine and to injury to the bladder mucosa from overdistention or trauma rather than to the catheter.

9. Acute retention and bladder residual predisposes to postpartum pyelitis.

REFERENCES

- (1) *Chamberlain, Wm.*: Am. Jour. Obst., April, 1877, x, 190. (2) *Taussig, F. J.*: Surg., Gynec. and Obst., October, 1915, xxi, 416. (3) *Shutter, H. W.*: Jour. Am. Med. Assn., Aug. 5, 1922, lxxix, 449. (4) *Schmitz, E. F.*: Jour. Missouri Med. Assn., March, 1923, xxi, 61. (5) *Stevens, W. E., and Arthur, E.*: Jour. Am. Med. Assn., November 22, 1924, lxxxiii, 1656. (6) *Curtis, A. H.*: Jour. Am. Med. Assn., April 21, 1923, lxxx, 1126. (7) *Curtis, A. H.*: Jour. Am. Med. Assn., May 6, 1916, lxvi, 1456. (8) *Cabot, H.*: Jour. Iowa State Med. Soc., April, 1923, xiii, 153. (9) *Ballinger, E. G., and Elder, O. F.*: South. Med. Jour., April, 1927, xx, 321.

99 COMMONWEALTH AVENUE.

Gardiner-Hill and Smith: Menorrhagia as a Symptom of Myxedema. The Lancet, 1927, ccxii, 862.

The writers analyzed the menstrual histories of 59 patients with myxedema. They calculated that myxedema tends to develop in approximating two-thirds of all cases before natural menopause, and in the majority of these cases it is accompanied by menorrhagia.

They emphasize particularly that where pelvic examination reveals no abnormality, the possibility of thyroid deficiency should always be considered.

NORMAN F. MILLER.

PROTEIN THERAPY IN GYNECOLOGY*

BY G. F. HIBBERT, M.D., CHICAGO, ILL.

THE chief fundamental upon which every form of therapy is based is to aid the organism in fighting those factors that produce the disease of the organism. Not only do we use specific therapy, that is, the neutralization and destruction of toxic substances, but also non-specific therapy that through irritation produces activation of the diseased tissue. To produce the activation foreign substances are employed, preferably proteins introduced parenterally. These protein bodies activate the protoplasm and increase the functioning of the cell. This irritative influence upon inflamed tissue leads to the destruction of the weakened cells, and on the other hand, stimulates the remaining healthy cells to more energetic growth.

Protein therapy was first demonstrated more than twenty-five years ago by Koch and Pasteur, and the work has been developed by Ehrlich, Flexner, and others to the extent that specific immunization is now used with impunity. Out of the primary and basic form of therapy, the so-called nonspecific protein therapy has developed, and the work of these pioneers shows that foreign serums and antitoxins produced remedial reactions in such conditions as arthritis, tuberculosis, and septicemias when injected into the infected organism. As the knowledge of physiologic chemistry and immunology increased, various forms of proteins were used, such as normal blood taken from the human being, the goat, horse and guinea pig, cerebrospinal fluid, leucocytic extract, egg albumen, milk, vaccines, and many others. Milk was first used by Lindig, in the form of a purified casein preparation which he called "caseosan," and Schmidt and Saxl in 1916 used boiled pasteurized milk in their work. Uddgren in 1918 carried on a series of experiments using a sterile milk preparation and obtained very much the same results. During the last decade many prominent biologists, such as Fränkel, Wright, Lindig, Müller, Holler, Peterson, and Hektoen, have done exhaustive work upon the subject, and I believe from their results that some day protein therapy will have replaced many forms of present day therapeutics and will prove to be one of the greatest adjuncts to preventive medicine.

In the field of urology, nonspecific protein therapy has established a name for itself as seen in the work done by Culver in 1921, who reported a series of cases of acute and chronic gonorrheal infection

*Read at a meeting of the Chicago Gynecological Society, April 20, 1928.

treated by milk injections. Lewi, in 1923, states that milk injections are very beneficial in treating chronic venereal infections that do not respond to other forms of therapy. Holloway and von Lackum, of Rochester, in 1923 wrote a paper on the *Local Aspects of Chronic Prostatitis*, in which special emphasis was placed upon the use of milk injections. In the field of ophthalmology we find such enthusiastic workers as May, who in 1924 read a paper discussing the value of foreign protein therapy in connection with diseases of the eye. In the field of internal medicine, work done by J. W. Miller in 1921 in connection with acute infections, and by Eidelberg in 1922 with arthritis, show how beneficial this form of treatment is.

Gynecologists have been rather reluctant to accept protein therapy as a standard form of treatment in their special field, and I believe that one reason for this cautious attitude is a lack of careful study and an indifferent air toward the work. It must be remembered that up to only a short time ago, a great percentage of gynecologic patients were always considered clear-cut surgical cases. Fortunately for the patients this radical point of view has been greatly tempered, and as we observe the pendulum's rise on the conservative arch of its swing, we notice an ever increasing interest in protein therapy. Gellhorn in the *AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY* of November, 1924, highly recommends protein therapy as a means of treating gonorrhea in the female, and reports several cases of generalized pelvic infection apparently cured after a series of injections. Rawls, in the *New York State Journal of Medicine* in December, 1925, writes of the use of milk injections in pelvic infections. More work along this line has been done in the European clinics than in this country, and their results show that protein therapy has a definite place in the treatment of inflammatory conditions of the pelvis.

With the development of nonspecific therapy, there have been many endeavors made to find a satisfactory explanation for the therapeutic results obtained. We know that it is impossible for us at this time, with our meager knowledge of physiologic and colloidal chemistry, to comprehend the intricate chemical changes that take place in the cells of the body under normal or pathologic conditions. But from the exhaustive research of the serologists and immunologists, aided by the microscope, we can follow many of the changes taking place in the blood stream and tissues under normal and diseased conditions, and especially following the introduction of foreign proteins parenterally. These changes are divided into a "general reaction," manifested clinically usually by a slight chill, a rise in body temperature, and perhaps nausea, this being usually followed by a feeling of exhilaration that may last for several days. It is during this period that we

know there is a general rejuvenation of all the cells of the body, and the worn-out fighting forces of the organism are replenished and activated, the phagocytic properties are restored, and the rate of metabolism as well as catabolism is increased. The "local reaction" is manifested by an increased tenderness at the site of the infection, and by inflammation, with moderate swelling and redness of the parts. This is, of course, identical with the reaction shown by all the remote tissues and organs, but here we have a more intensified warfare being carried on by definitely diseased cells against bacterial poisons and active pathogenic organisms.

Work done by Holler, Weiss, Hektoen and others show conclusively that following the injection of foreign protein there is a marked increase of function in all of the hematopoietic organs, and a corresponding increase in the number of phagocytes of the blood stream. Also we may assume from the apparent increase of functionability of the great filtering centers of the body, namely, the spleen, red bone marrow, and liver, that the large number of active antibodies produced are rapidly causing an agglutination and clumping of bacteria which are being trapped in these filters. Practically all workers in this field have proved that there is always a moderate increase in the eosinophiles and a marked increase in the polymorphonuclear leucocytes of the neutrophile type.

Since milk is composed of many elements, it is difficult to determine just what components are responsible for the results. Uddgren is of the impression that the bacterial content is responsible for a large percentage of the reactions, as he showed that reactions following the use of sterile, boiled milk were always much less severe than when pasteurized milk was used. Bessau, Decastello, and Müller believe this true to a certain extent but also believe that the split proteins found in the milk play an important rôle. Schmidt and Kaznelson have often noticed a primary leucopenia lasting for a period of twenty-four hours before the leucocytosis was noticed, and this was also observed in the opsonic index curve by Hektoen and others.

In gynecology and particularly in the dispensary work, one of the chief complaints that brings patients to us is pain. Very often this pain is persistent and severe enough to incapacitate the patient to the extent that she cannot earn a livelihood. A large percentage of the cases used as material for this paper usually manifested the following symptoms in some degree:

1. Pain, usually of a persistent type, either fairly well localized to either lower abdominal quadrant or culdesac, or generalized over the entire lower abdomen.

2. Backache, sacroiliac type, more noticeable after physical exertion, or before, during, and after menstruation.
3. A feeling of fullness and pressure over the lower abdomen.
4. Irregular or prolonged menstruation, and oftentimes bleeding between periods.
5. An irritating, white, or yellow vaginal discharge.
6. Intermittent bladder tenderness, accompanied by frequency of urination.

It is often very difficult in cases of long standing to make any clinical diagnosis other than that of a generalized pelvic infection, but an attempt has been made to diagnose and classify all the cases from an etiologic and clinical standpoint. A careful history, smears, and blood tests were used where indicated, and these were checked so as to increase our accuracy. Generally, I found that the cases could be classified as definite gonorrheal infections, postpartum infections, post-abortive infections, and cases of doubtful etiology. It was also necessary in connection with history taking to rule out the poor risks. I have found, as others have, that there are definite contraindications for protein therapy. Patients giving a definite history of serum sickness, asthma, epilepsy, diabetes, or myocarditis are not fit subjects, likewise pregnancy and arteriosclerosis are contraindications. If the danger of anaphylaxis is to be minimized, the above precautions must be considered. I might also add that the most important point in the technic to abolish anaphylactic shock is to be positive that the end of the hypodermic needle does not rest within a vein. By drawing back the piston of the syringe before injecting the material is the only safe method of determining this and should always be done.

A careful bimanual examination of these patients was made before they were subjected to these routine injections and an accurate sketch was recorded upon the chart of the findings. The findings were usually checked by another member of the clinic, and the sketches were recorded at regular intervals to record any change in the pelvic condition. After the patients had received the entire course of injections, they were temporarily discharged with instructions to return to the clinic at the end of a three-month interval, at which time a post card was sent to remind them. At these periods, a careful interval history was obtained, a thorough pelvic examination made, and a sketch made of the findings. This was carried out over the period of a year for the purpose of determining the permanency of the cure.

Examination of these cases usually revealed the following conditions to some extent:

1. Cervix: Usually showed evidences of infection, and in the multiparae were enlarged, boggy, everted, and eroded.

2. Uterus: Often in malposition, usually retroverted, or displaced laterally and fixed, soft, enlarged, and tender to touch; or absent as in cases having had a hysterectomy.

3. Adnexa: Usually bilaterally involved, enlarged, very tender, and often a soft, irregular mass involving the ovary, and filling the side of the pelvis and culdesac was demonstrable.

4. Uterosacral ligaments: Often very tender and distinctly palpable in the posterior fornix.

5. Bladder: Often marked tenderness over the area after complete emptying.

In other words, the findings were essentially those of acute or chronic pelvic infections.

The technic used in treating these cases was uniform in nearly all instances, the variations being due to peculiarities shown by individual cases. The preparation known as Aolan was used because of its accessibility, relatively low cost, and the fact that it is a fairly well-standardized, sterile product. The initial dose used was 4 c.c., and at regular four-day intervals, a dose of 7 c.c. was given. I found by experience, that patients react better if small doses are given at frequent intervals rather than relatively large doses (10 c.c.) at intervals of one week. The injections were given deep into the gluteal muscles, and the area over the site of injection was not massaged. To satisfy myself that the desired "general reaction" was being obtained, the temperature curve and leucocytosis were recorded in many of the cases of private practice. Whenever the patients complained of severe headaches following an injection, a rest period of one week was allowed before resuming the series. Patients were asked to report any chills experienced, but fortunately, none was noticed. The only other therapeutic measure instituted along with the injections of foreign proteins were:

1. Warm alkaline douches, used in many instances for psychic effect.
2. Cauterization of badly eroded cervixes.
3. Diet used to help alleviate constipation.
4. Knee-chest position used where inflammatory exudates were responsible for malposition of the uterus.

5. Diathermy was used in conjunction with the protein therapy in a series of eighteen cases but these were not included in the original series. This therapy was carried out along with the injections and in several cases continued after the injections were completed. The Chapman type of electrodes was found to be very effective, the other electrode being placed upon the lower abdomen or upon the sacrum. Many of the persistent cases yielded nicely to this combination of treatment.

Where there were definite, clear-cut indications for surgery, such as uterine fibromas, ovarian cysts, rectocystocele, and uterine prolapse, the cases were not considered desirable material, excepting where there was an active pelvic inflammation; in these cases, the patients were given a series of twelve injections before being operated upon, and here I found that these patients were far better operative risks and recovered more rapidly than those not receiving the Aolan.

TABULATION OF CASES

Number of patients treated	152
Number of injections given	1,824
Number cases of anaphylactic shock	0
Percentage of cases relieved entirely of pain	82%
Percentage of cases relieved of pain and pathology	46%
Percentage of patients not helped by injections	14%
Number of cases of gonorrhea	42
Number of cases of postpartum-postabortive infection	67
Number of cases of unknown etiology	43
Number of cases of unilateral salpingitis	51
Number of cases of bilateral salpingitis	76
Number of cases of bilateral salpingitis and generalized adnexitis	26
Number of cases combined with diathermy treatments	18

I fully realize that many gynecologists stamp protein therapy as a modification of the old "shotgun prescription" type of treatment but at the same time, we must remember that we are dealing with a condition that has evolved itself into a vicious circle, and no one definite pathologic identity exists in many instances. Furthermore, many of these patients have been treading the halls of our clinic for months and have been the recipients of far too many vaginal tamponades and douches. Finally after having derived no benefit, they are sent to the operating table for a laparotomy. It was interesting to note that several patients in this series were patients who, after operation for a long-standing pelvic infection, reported to our clinic complaining of the same pain they had before operation, and were infinitely better after receiving twelve injections of Aolan.

The results obtained were very instructive and in many cases gratifying. It was surprising to feel by palpation these large, exquisitely tender inflammatory masses begin to "melt away" after from one to five injections and to be able to lift a uterus up out of the culdesac that at the beginning of the treatment was definitely fixed. The patients themselves voluntarily would tell me that the backache and pain were much better and they had a better appetite, slept better, and "felt altogether different." Perhaps these patients were not "cured" in the scientific sense of the word, but at least they were benefited to the extent of returning to their work and were a benefit to the community, and were encouraged "to carry on" once more. The result in a large percentage of the cases was very good, but many patients

derived very little, if any, benefit. This, of course, was to be expected, but from my observations I am sure that the following conclusions may be drawn:

1. That acute and chronic pelvic inflammatory infections are benefited by the injections of foreign protein.
2. That the results derived from foreign protein therapy are based upon scientific evidence and facts and are not mythical or psychic in character.
3. That protein therapy is a conservative form of therapy and should always be thought of in the management of inflammatory pelvic lesions before operative measures are attempted.

REFERENCES

Lindig, Paul: Deutsche med. Wehnschr. 47: 585, 1921. *Saxl, P*: Wien. klin. Wehnschr. 29: 1043, 1916. *Udögren, G*: Milchinjection in der Ophthalmologie, Stockholm, 1918. *Schmidt, R., and Kaznelson, P*: Ztschr. f. klin. Med. 83: 79, 1916. *Muller, E. F*: Wisconsin M. J. 26: June, 1927. *Hektoen, L*: J. A. M. A. 66: 1591, 1916. *Culver, H*: Proc. Inst. Med., Chicago. 50: 93, 1916-17. *Holloway, J., and von Lackum, W*: M. J. & Rec. 122: 23, July, 1925. *May, J. W*: J. Kansas M. Soc. 24: 283, Oct., 1924. *Eidelsberg, J*: J. A. M. A. 78: 1788, June 10, 1922. *Miller, J. L*: J. A. M. A. 76: 308, Jan. 29, 1921. *Gellhorn, Geo*: J. Missouri M. A. 19: 341, 1922. *Gellhorn, Geo*: AM. J. OBST. & GYNEC. 8: 535, Nov., 1924. *Gellhorn, Geo*: New Orleans M. & S. J. 78: 357, March, 1926. *Rawls, R. M*: New York State J. Med. 25: 1108, Dec., 1925. *Peterson, W. F*: Protein Therapy and Nonspecific Resistance, New York, 1922, The Macmillan Company.

6353 BROADWAY.

(For discussion, see page 272.)

THE INTERPOSITION OPERATION FOR PROLAPSE OF THE UTERUS

A STATISTICAL STUDY OF 91 CONSECUTIVE OPERATIONS AND AN ANALYSIS OF THE END-RESULTS*

BY JOSEPH L. BAER, M.D., AND RALPH A. REIS, M.D., CHICAGO, ILL.

THE interposition operation for prolapse of the uterus has long since become established as one of the standard procedures in gynecology. Simultaneously developed by Watkins, of Chicago, and Wertheim, of Vienna, in 1899 the operation has, to a large extent, in certain types of prolapse displaced all other methods in most clinics.

Indications.—In the gynecologic department of the Michael Reese Hospital the interposition operation is selected for those cases of prolapse in which there is a large cystocele. The patient must be past the menopause or be willing to be sterilized. The reason for this is obvious: pregnancy and labor give rise to a high degree of dystocia in the interposed uterus. This procedure is best suited for those patients in whom the corpus is of a size sufficient to occlude properly the

*Read at a meeting of the Chicago Gynecological Society, April 20, 1928.

hernial opening and prevent secondary bladder prolapse. The selection of patients must be limited further to those in whom there is no uterine tumor too large to allow the fundus to come through the peritoneal opening. In addition there must be neither gross adnexal disease nor pelvic adhesions.

Incidence.—This report is an analysis of the last 91 consecutive interposition operations done for prolapse of the uterus by the gynecologic staff of the Michael Reese Hospital. During the period covered by this series there were 129 operations for prolapse of the uterus done by various other methods, making an incidence of approximately 40 per cent for the interposition operation.

Anamnesis.—The average age was forty-five and five-tenths years. The oldest patient was sixty-five years and the youngest was twenty-four years. The latter was a para v, with partial prolapse and a large cystocele in whom sterilization was requested by the Social Service Department. Four authors report average ages of forty-three years,² forty-four years,³ forty-five years,⁴ and fifty-six years⁵ and two give an age range of thirty-three to seventy⁶ and twenty-five to sixty-eight.³ Twenty-eight patients (31 per cent) were definitely through the menopause. In three other series the figures were 29 per cent,³ 37 per cent,⁶ and 39 per cent.⁷

Age Incidence.—The oldest patient was sixty-five, the youngest twenty-four, the average age being forty-five and one-half years.

Parity Incidence.—That parity plays a rôle in the production of prolapse of the uterus is axiomatic. Nevertheless there was one nullipara and five primiparae in whom the interposition operation was indicated. The average parity for the entire series was 4.4, and they ranged from nullipara to para xiv. One author⁵ gives an average parity of 4 and the range varies from 1 to 12² to 1 to 16.⁶

Para	O	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV
No.	1	5	12	16	17	16	8	5	5	2	2	1			14

Previous Operations.—Ten patients had previously undergone gynecoplastic operations previously. There were 6 anterior and posterior colporrhaphies, 2 Gilliam suspension operations, 1 cervical amputation, and 1 prolapse operation performed ten years previously, type unknown.

Symptoms.—The symptoms complained of, in the order of their frequency, were protrusion 56, or 61 per cent; backache 33, or 36 per cent; urinary frequency 29, or 32 per cent; constipation 23, or 25 per cent; lower abdominal pain 17, or 19 per cent; bearing down 16, or 17 per cent; dysuria 14, or 15 per cent; leucorrhea 8, or 9 per cent; metrorrhagia 3, or 3 per cent; incontinence 2, or 2 per cent; menorrhagia 1, or 1 per cent. Spaulding's² analysis of complaints shows a striking resemblance and parallel in the order of their frequency, viz., protrusion

<i>Symptom</i>	<i>Number</i>	<i>Percentage</i>
Protrusion	56	61%
Backache	33	36%
Frequency	29	32%
Constipation	23	25%
Lower abdominal pain	17	19%
Bearing down	16	17%
Dysuria	14	15%
Leucorrhea	8	9%
Metrorrhagia	3	3%
Incontinence	2	2%
Menorrhagia	1	1%

78 per cent, backache 42 per cent, constipation 37 per cent, dysuria 18 per cent, and incontinence 17 per cent. This last figure which is so widely at variance with our own percentage may be due to a difference in interpretation.

Pathology.—Partial prolapse occurred 47 times, or 52 per cent, and complete prolapse 44 times, or 48 per cent. Complete prolapse as used here includes all degrees of prolapse in which the cervix or corpus protrudes through the vulva. Partial prolapse includes all degrees of prolapse in which the cervix does not protrude. By a more accurate classification our series presents the following figures: First degree (cervix down to the level of the ischial spines) 7 cases, or 8 per cent; second degree (cervix to vulva) 42 cases, or 46 per cent, and third degree (cervix or corpus through the vulva) 42 cases, or 46 per cent. Both classifications are given because there is no uniformity in American, English, or German textbooks or literature, and the term *procidencia* is used indiscriminately for cases in which either the corpus or the cervix protrudes through the vulva. There is opportunity here for clarification and unanimity of expression.

<i>Prolapse</i>			<i>Cervical hypertrophy</i>	11 cases
First degree	7 cases	8%	Cervical lacerations	31 cases
Second degree	42 cases	46%	Fibrosis uteri	7 cases
Third degree	42 cases	46%	Fibroids	5 cases
Cystocele	81 cases		Cystic ovary	1 case
Rectocele	91 cases			

Cystocele and rectocele were noted in 83 patients and rectocele in 8 patients. Cervical hypertrophy occurred 11 times and marked cervical lacerations 31 times. In 7 patients there was a definite fibrosis uteri and 5 patients exhibited one to four small fibroids. Polycystic degeneration of the ovary occurred once.

Technic.—Many patients with prolapse of the uterus show the effects of prolonged edema together with superficial ulceration of the portio mucosa and hernial sac. These conditions are given preliminary attention by bed rest with the foot of the bed elevated sufficiently to maintain reposition. During this time the ulcerations are treated with dermatol tampons or other similar antiseptics.

The technic of the interposition operation requires no detailed exposition. Several points, however, are worth mentioning. The dissection of the anterior vaginal wall should be thin enough to develop the fascial layer. Hemostasis in the deep lateral angles is best accomplished by double clamp and ligation of the vesico-uterine ligaments according to Spaulding.¹³ Painsstaking hemostasis throughout the operation preventing hematomas and secondary infection is imperative. The peritoneal opening should be closed by attachment to the posterior surface of the uterus. The reason for this is apparent. Usually the opening is snug enough to prevent automatically protrusion of abdominal viscera but occasionally the peritoneum tears and, with postoperative vomiting, a loop of bowel may become incarcerated.

The fundus uteri should be anchored securely against the pubic bone, using bilateral mattress sutures of forty day chromic gut or kangaroo tendon. Placing the anchoring sutures anterior to the fundus decreases the acute angulation of the uterus but assures a firm fixation. Placing the anchoring sutures posterior to the fundus fulfills the technic of the operation as originally described but increases the likelihood of recurrence if there is marked relaxation of the broad ligaments and uterosacral ligaments. For vaginal apposition a running lock-stitch is used without tension, employing twenty-day chromic gut in two or more sections. No vaginal packing is used.

Operative Procedures.—A posterior colpoperineorrhaphy was done in each patient. This step is essential in the prevention of recurrence. Cervical amputation was done 11 times and cervical repair 15 times, a total of 26 operations on the cervix, or 29 per cent. Three authors give the following incidence for this procedure: 30 per cent,⁶ 66 per cent,⁷ 79 per cent.⁸ Dilatation and curettage were done 6 times; myo-

OPERATIVE PROCEDURES

Postcolpoperineorrhaphy	91
Cervical amputation	11
Cervical reconstruction	15
Dilatation and curettage	6
Myomectomy	5
Defundation	2
Radium insertion	1
Oophorectomy	1
Sterilization (cornual excision)	49

mectomy, 5 times, defundation, twice, radium insertion once and an oophorectomy once. There were also 3 hemorrhoidectomies.

Forty-nine patients, 53 per cent, were sterilized by cornual excision and 28, or 31 per cent, were definitely past the menopause, a total of 77, or 84 per cent. Of the remaining 14 patients, 12 were having menopausal symptoms at the time of operation and in the operative write-up no mention was made of sterilization. In 2 patients steriliza-

tion was forgotten. One of these, a para iv, aged thirty-eight years, was sterilized by deep x-ray therapy before leaving the hospital. The other, a para vii, aged forty-one years, subsequently became pregnant and was delivered by cesarean section at which time sterilization was done. This case has been reported previously by Stein.¹

Immediate Postoperative Results.—There was 1 death in this series, an incidence of 1.1 per cent. The patient was a para v, aged sixty-five years, whose preoperative blood pressure was 170 mm. The uterus was completely prolapsed (3rd degree). The convalescence was uneventful and afebrile. On the eighth day at the time of the removal of the perineal silkworm gut sutures, the patient fainted. No significance was attached to this as she promptly revived. Thirty minutes later she suddenly gasped and died. In the absence of an autopsy a diagnosis of cerebral embolism was made. Mortality figures in the literature range from no deaths in two series of 56 patients⁵ and 58 patients respectively⁸ to 1.3 per cent,⁶ 1.7 per cent,⁴ and 4.4 per cent.⁷

IMMEDIATE POSTOPERATIVE RESULTS

<i>Condition</i>	<i>Number</i>	<i>Percentage</i>
Death-embolism	1	1.1
101° F. x 1	39	43.0
101° F. x 7 or more	10	11.0
Infected perineum	2	2.2
Infected ant. vag. wall	2	2.2
Foul discharge	4	4.4
Pelvic abscess	2	2.2
Shock and sepsis	1	1.1

Thirty-nine patients (43 per cent) had a postoperative temperature of 101° F. on one or more days. Of these 10 (11 per cent) had a temperature of 101° F. or more for seven days. Definite infection of the operative field occurred in 11 (12.1 per cent) patients. Two had infections of the perineum, 2 of the anterior vaginal wall, 4 had foul discharges without localization, 2 developed pelvic abscess, and 1 had sepsis and shock from which the recovery was complete, with a satisfactory operative result. Of the 5 failures in this series only 2 occurred in patients who developed postoperative infections.

Fifty-two patients (57 per cent) required no postoperative catheterization. In Rongy's series 14 per cent³ required no catheterization. Of the remaining 39 patients, 11 (12 per cent) were catheterized only once, 16 (18 per cent) were catheterized from one to four days and 11 (12 per cent) were catheterized from five to ten days. One patient was catheterized daily for nineteen days for residual urine. Of 6 patients with cystitis, 5 developed this condition postoperatively. In 2 of these, no catheterization had been done at any time. Two others had been catheterized but once on the first postoperative day. The fifth patient had required catheterization for seven days. The sixth patient had a preoperative cystitis due to the presence of a bladder stone. Brady⁵

reports one case of cystitis in his series, or 1.8 per cent, and Rongy³ 1 case of pyelocystitis, or 1 per cent, of his series.

POSTOPERATIVE CATHETERIZATION

None	52	2 postoperative cystitis
Once	9	2 postoperative cystitis
One day	1	
Two days	5	
Three days	5	
Four days	5	
Five days	2	
Six days	3	
Seven days	2	one postoperative cystitis
Eight days	2	
Nine days	3	
Ten days	1	
Nineteen days	1	daily for residual urine

The average hospital stay in this series was seventeen and two-tenths days. None was sent home before the twelfth day postoperative and the longest stay was sixty-five days. In Rongy's series of 100 patients, the average hospital stay was twenty-five days.

End-Results.—Follow-up examinations were made from five months to seven years postoperative in 64 patients (70 per cent). There were 5 recurrences in 2 of which there had been postoperative infection. Figured on the basis of the follow-up group there were 92.2 per cent successes. Among these 1 patient showed a partial fundus protrusion and 2 showed a first degree prolapse, all 3 patients having originally had third degree prolapse. Of the articles in which a follow-up study was made, Grad reports 78 per cent successes and 14 per cent partial successes—a total of 92 per cent; Pfeiffer⁹ gives 92.4 per cent cures; Brady⁵ states "93 per cent good results," and Johnson¹⁰ reports 90 per cent cures. Hundlér and Hundley¹¹ show 90 per cent cures; Shaw states that 13 of 58 patients were unimproved or 77 per cent cures but found that there was only 1 failure in the last 21 cases, or 95 per cent cured. Watkins¹² reports 42 per cent perfect results in 49 patients—86 per cent. Miller⁶ states that 93 per cent are well and Phaneuf's series shows 95 per cent cures.

Residual Complaints and Sequelae.—Among 8 patients with residual complaints, leucorrhœa existed in 4, backache in 2, spotting in 2 and frequency in 3. There were 4 secondary operations, a Murphy extra-

SEQUELAE

<i>Residual Complaints</i>		<i>Secondary Operations</i>
Leucorrhœa	4 times	1 Murphy extrafascial fixation
Backache	2 times	1 Mayo vaginal hysterectomy
Spotting	2 times	1 cesarean section with sterilization
Frequency	3 times	1 Sturmdorf enucleation of cervix

fascial fixation and a Mayo vaginal hysterectomy on 2 of the recurrences, the cesarean section previously mentioned, and a Sturmdorf operation for leucorrhœa.

CONCLUSIONS

1. This report is an analysis of 91 consecutive interposition operations for prolapse of the uterus. Of the patients who were subsequently examined from five months to seven years postoperative, 92 per cent were cured. There was 1 death, a mortality of 1.1 per cent.

2. The interposition operation is the operation of choice at the Michael Reese Hospital in 40 per cent of all patients with prolapse.

3. The operation is selected for those patients with a large cystocele, a corpus uteri neither too small nor too large, freely movable and without gross adnexal pathology.

4. Cervical amputation or repair is essential in the presence of elongation or disease.

5. A well-reconstructed perineal body is most important for the success of this procedure.

Acknowledgment is hereby made to the members of the gynecologic staff of the Michael Reese Hospital for the use of their records.

REFERENCES

- (1) *Stein, I. F.*: J. A. M. A. 81: 468, 1923. (2) *Spaulding, A. B.*: Calif. State J. Med. 20: 2, 1922. (3) *Rongy, A. J.*: J. A. M. A. 69: 1864, 1917. (4) *Shaw, H. N.*: Surg. Gynec. Obst. 34: 394, 1922. (5) *Brady, K.*: Ibid. 43: 476, 1926. (6) *Miller, C. J.*: Ibid. 38: 348, 1924. (7) *Grad, H.*: AM. J. OBST. & GYNEC. 8: 163, 1924. (8) *Phancuf, L. E.*: Ibid. 8: 323, 1924. (9) *Pfeffer, J.*: Monatsschr. f. Geburtsh. u. Gynäk. 54: 236, 1921. (10) *Johnson, F. W.*: Surg., Gynec. Obst. 42: 527, 1926. (11) *Hundley, J. M., and Hundley, J. M. Jr.*: Ann. Surg. 76: 106, 1922. (12) *Watkins, T. J.*: Tr. Am. Gynec. Soc. 34: 123, 1909. (13) *Spaulding, A. B.*: Tr. Am. Gynec. Soc. 51: 214, 1926.

104 SOUTH MICHIGAN AVENUE.

(For discussion, see page 269.)

CARCINOMA OF FUNDUS OF UTERUS FOLLOWING WATKINS' INTERPOSITION OPERATION

BY ANTHONY CORVESE, M.D., PROVIDENCE, R. I.

Gynecologist, Providence City Hospital

AT THE Fifty-Second Annual Meeting of the American Gynecological Society, in May, 1927, Dr. John A. McGlinn, of Philadelphia, reported a case wherein a successful interposition operation was followed by carcinoma of the body of the uterus. In connection with this he discussed at some length the various pathologic findings following this procedure, and also emphasized the great difficulties which attend any further operative intervention upon a uterus so treated. He found that pregnancy was the most serious complication following the performance of the interposition operation, a number of instances where this has occurred being on record. He was not able to find any instance besides his own where the Watkins procedure had been followed by the development of carcinoma of the fundus. In view of the apparent rarity of such a finding, the following case has an interest which does not ordinarily attach to the neoplasm in question.

Mrs. R., aged fifty-five years when seen August 7, 1919. She was the mother of three children. The menopause had taken place five years before, and two years previously an interposition operation had been performed by another surgeon. Her present complaint was vaginal bleeding which had its onset one month before. There was a foul, bloody discharge now coming from the vagina, but examination showed the results of the operation to have been excellent, with vagina and cervix free from disease. As the difficulty was evidently in the body of the uterus, a diagnostic curettage was undertaken. The material obtained proved typical of carcinoma, and upon this evidence a vaginal hysterectomy was done.

The operation was extremely difficult on account of the previous Watkins procedure. Indeed, even the curettage was difficult to accomplish because of the position of the uterus.

The uterus proved to be very large, showing upon the posterior surface of the fundus an ulcerated growth some 2 cm. by 1 cm., which histologic examination demonstrated to be adenocarcinoma. The patient made an excellent operative recovery, but some eight weeks later ascites developed, this condition proving to be dependent upon malignant metastasis, from which she died about four months after the removal of the uterus.

A consideration of this case and the one reported by McGlinn, which it very closely resembles, leads us to inquire whether carcinoma of the fundus might be induced by the performance of the Watkins operation, and also if the fact that it is such a rare finding, as indicated by the reporting of only 2 cases among the relatively large number of other sequelae of the interposition operation, has any special significance.

As regards the first point, the discussion which followed the presentation of Dr. McGlinn's paper offers some interesting comments. Dr. Dougal Bissell, of the Woman's Hospital, New York, stated that he had done no more than 25 interposition operations, yet in 3 of the patients so treated malignancy of the uterine fundus had later been demonstrated by pathologic examination of curetted material. None of these cases, apparently, had ever been reported. Operation was performed upon 2 patients and in both cases the procedure was found to be very difficult because of the adhesions of the interposed uterus. The speaker gave it as his opinion that the corpus was just as likely to develop malignancy after interposition as if the operation had not been done, but he evidently did not consider the intervention as in any way predisposing to the development of carcinoma. Another speaker stressed the importance of doing a high amputation of the cervix as a preliminary to the Watkins procedure and offered it as his opinion that the likelihood of the woman's subsequently developing carcinoma was thereby greatly lessened, as the cervix is often the seat of laceration, ectropion, and chronic endocervicitis, so that the amputation will "eradicate a good deal of precancerous pathology."

The consensus of opinion seemed to be that where carcinoma of the fundus did develop, it was not because the Watkins operation had been done, but *in spite of it*. Where the tendency toward malignancy of the uterus existed, its chances of development were not enhanced

by the performance of the operation. McGlinn, however, cautioned against carrying out the procedure when there was the slightest reason to suspect the uterus was malignant, or without thorough curettage and microscopic examination of the material so obtained. If malignancy is discovered, hysterectomy, and not interposition, is the proper procedure.

As to the significance of the extreme rarity of malignancy after interposition, figures relating to the prevalence of carcinoma of the uterine fundus in general are pertinent. All writers unite in saying that in comparison with carcinoma of the cervix, that occurring in the uterine fundus is very rare indeed. Cullen, whose textbook on uterine cancer though written in 1900 is still a standard, saw 182 cases of malignancy in six years, 147 of which were of the cervix and 35 of the body of the uterus. Bland merely states that 90 per cent of all uterine carcinomas are in the cervix; Bandler puts it the other way round, saying that only 10 per cent of uterine cancers are observed in the fundus; Graves says that carcinoma of the fundus occurs only one-eighth as often, "according to statistics." Kelly, in his *Operative Gynecology*, gives the total of admissions to his gynecologic clinic at Johns Hopkins Hospital, during the first fifteen years of its existence, as 11,382; of these, 412, or 3.6 per cent, were uterine carcinoma. Only 87 of these uterine carcinomas were found in the fundus, that is, less than 0.8 per cent of all gynecologic admissions to this clinic. Frank, in his *Gynecological and Obstetrical Pathology* states: "About 10 to 15 per cent of uterine cancers occur in the corpus, according to most statistics." In 500 cases Peterson found 94, or 18.8 per cent, cancers of the body; Koblanck, in 6354 cases, only 4.4 per cent; Wilson (London, 1917), in 596 cases, 11.2 per cent, while Wertheim's clinic—possibly the largest and most renowned in all Europe—saw only 70 corporeal to 1500 cervical cancers (4.6 per cent).

At the University Hospital, Philadelphia, in a period of twenty-three years, 12,514 gynecologic patients were observed, among which were 115 cases of fundal carcinoma. This lesion constituted about 15.2 per cent of all genital cancers seen, and 25 per cent of all uterine cancers. These figures, which were given by Charles C. Norris in 1923, are considerably higher than the classic textbook estimates. Meigs, at the Free Hospital for Women, Boston, found that the number of patients with carcinoma of the uterine fundus operated upon there represented 0.47 per cent of all operations at the institution. Though he does not expressly say so, it is probable that practically all of these operations were gynecologic in nature. The actual number of all operations for a given period was 9,566, while the number of cases of carcinoma of the fundus was 44. There were 350 patients with carcinoma of the cervix operated upon during the same length of time. This author makes the following observation upon these figures: "In hospital practice, at least among patients coming from the working

classes, the percentage of adenocarcinoma of the fundus seems to be very much less than the percentage of carcinoma of the cervix. There were 7.9 times as many cases of carcinoma of the cervix as adenocarcinoma of the fundus. On the contrary in private practice there undoubtedly are more cases of adenocarcinoma of the fundus than of carcinoma of the cervix."

From this rather impressive testimony it would seem fair to conclude that the rarity of carcinoma of the fundus following the interposition operation corresponds quite accurately to the rarity of its occurrence in gynecologic admissions generally. It is also quite commonly stated that parous women are more subject to malignancy of the cervix, whereas nulliparous women are more prone to develop fundal lesions. The prevalence of this opinion does not seem to have the same statistical basis as that just considered. Norris and Vogt say, "It would appear that childbirth plays little part in the etiology of this neoplasm, and that the disease is relatively as frequent in the nulliparous as in the multiparous." Thirty-seven of Meigs' 44 patients were married, 33 (75 per cent) having had children; "so that, judging from our figures, the disease is more likely to be found in women who have borne children than in those who have not. . . ."

Many writers (Graves, Montgomery, Adami and Nichols, Hirst) believe carcinoma of the fundus to be a disease of the nulliparous, but this belief is not substantiated in this series, for most of our patients had borne children. Ashton says, "The disease attacks women who have borne children and those who are sterile with about equal frequency." Frank collected the following figures: Among Theilhaber's cases of carcinoma corporis, 27.5 per cent were nulliparae; Deelmann found six times as many nulliparae among patients with corpus carcinoma; Goebel and also Fast concede double the percentage of corpus cancer in the nulliparous, but in women who have borne children, find an equal percentage. Cullen found 52 per cent of 19 cases of corporeal cancer nulliparous, Wilson's figures in 56 cases being 50 per cent. Most of the standard textbooks content themselves with saying, "it seems," "it is said," or "most observers claim" that carcinoma of the fundus occurs most often in women who have never borne children, but, as will be gathered from the quotations above, when concrete statements are made, there does not appear to be substantial agreement, one way or another.

The question naturally arises, inasmuch as the interposition operation is almost invariably done on uteri which have been several times pregnant, whether the fact that its subjects are parous has lessened their liability to cancer of the fundus. One aspect of the matter to which none of the writers seems to call attention is that the majority of women have borne children. More than 80 per cent of women who have reached the age of forty, generally conceded to be the beginning of the "cancer age," are married, and although I have not been able

to find any precise figures, I am quite sure that but a small percentage of these fail to bear at least one child. This is just as true of "private practice" as of the most unselected clinic work, opponents of birth control to the contrary notwithstanding. The fact that so comparatively few women "escape" motherhood before reaching the cancer age vitiates all statistics in regard to nulliparity.

The occasional occurrence of carcinoma of the uterine fundus after the Watkins interposition operation can certainly not be regarded as a contraindication for the employment of a procedure which is of the greatest value in the hands of a competent gynecologist who knows how to select his cases. The necessity of making certain that no incipient malignancy exists in a uterus about to be so treated has already been touched upon. While the routine physical examination would undoubtedly rule out any occult evidences, this is not enough. Thorough curettage, with proper pathologic examination of tissue thus obtained, is the only safe course. Polak, of the Long Island College Hospital, Brooklyn, said in discussion of McGlinn's paper, that it was customary at his institution to precede a vaginal fixation with a high amputation of the cervix, and thereafter to introduce about 50 mg. of radium into the body of the uterus. The purpose of the radium application was to produce atrophy of the uterus and still further safeguard the patient against cancer. This was applicable to birth injuries near the climacteric age.

The possibility of employing radium in prophylactic dosage some weeks previous to operation might also be considered. Such success has attended the use of this element in menopausal hemorrhage and other benign or precancerous lesions that a similar therapy would seem appropriate in the cases under discussion. Where there can be no question of further pregnancies, there is no contraindication to radium if used with skill and caution. As the occurrence of pregnancy is one of the gravest accidents following the interposition operation, and the most experienced gynecologists declare it should never have been done upon a functioning uterus, the possibility of sterilizing the patient by the use of radium is an advantage rather than a drawback. The whole question, however, would be one which would have to be decided in accordance with the demands of the individual case. Notwithstanding, preoperative employment of radium would seem a rational procedure.

REFERENCES

- Kelly, Howard A.: *Gynecology*. (With collaborators.) New York, 1923, D. Appleton & Co. Frank, Robert T.: *Gynecological and Obstetrical Pathology*, New York, 1922, D. Appleton & Co. Meigs, J. F.: *AM. J. OBST. & GYNEC.* 4: 241, September, 1922. Norris, Chas. C., and Vogt, M. D.: *AM. J. OBST. & GYNEC.* 7: 550, May, 1924. McGlinn, John A.: *AM. J. OBST. & GYNEC.* 14: 626, November, 1927, Discussion, pp. 670-672.

SEVERE TOXEMIA OF PREGNANCY WITH JAUNDICE

REPORT OF CASE WITH FETAL AUTOPSY FINDINGS

By IRVING F. STEIN, M.D., AND M. L. LEVENTHAL, M.D., CHICAGO, ILL.

(From the Michael Reese Hospital)

JAUNDICE as a complication of pregnancy is extremely rare, and is usually indicative of acute or subacute yellow atrophy of the liver. We have seen jaundice so rarely in pregnant women that this case in which there was beginning liver atrophy, and definite fetal pathology, we deemed worthy of a detailed report.

CASE REPORT

The patient, Mrs. W., a para ii, aged twenty-four, was first seen by us when admitted to the hospital on August 10, 1927, when she was twenty-six weeks pregnant. The last regular menstrual period was January 29, 1927, and since the onset of pregnancy there had been continuous and progressive vomiting, until at the time of admission the patient was extremely emaciated and unable to retain any food. She also complained of constant, aching, epigastric distress. The previous pregnancy, three years ago, was normal in all respects and the past medical history was negative except for whooping cough in early childhood. Examination on admission showed the skin and sclerae markedly icteric; heart and lungs were negative. The abdomen was soft and the uterine fundus extended just above the umbilicus. The lower edge of the liver was palpable in the epigastric notch. Relative liver dullness began at the level of the fourth rib and absolute dullness at the level of the seventh rib in the right mammary line. There was no edema. Ophthalmoscopic examination revealed normal discs. The temperature on admission was 98.6° F.; pulse, 126, and respiration, 20. *The blood pressure was 202/110.* The urine was very dark amber in color and was foamy, and contained much bile pigment as revealed by Smith's iodine reagent. There was also a distinct albumin reaction, and few granular and hyaline casts. No leucine or tyrosine crystals were isolated from the urine. The stools were normal in color. The blood findings were as follows: Hemoglobin, 60 per cent; R.B.C., 3,900,000; W.B.C., 12,900; sedimentation time, thirty-five minutes; nonprotein nitrogen, 39 mg.; creatinine, 1.3 mg. The direct van den Bergh test for bile gave a faint immediate positive, while the indirect van den Bergh gave an immediate positive reaction. The icteric index was 40.

With the above findings, we decided to terminate the pregnancy, and accordingly a 5 cm. Voorhees bag was introduced into the uterus and 1½ pounds traction applied. Labor pains began at once and the bag was expelled within six and a half hours. The fetus followed shortly thereafter. The fetus was living but not viable, and showed no signs of icterus.

During the time the bag was in the uterus, the patient was given an intravenous infusion of 500 c.c. of 10 per cent glucose solution, and this was repeated once daily for the next three days, using 25 units of insulin with the first two infusions. The patient vomited several times following the delivery, and the pulse varied from 100 to 126; the temperature was normal. For the next six days, the pulse was around 120 and on the seventh day it dropped to 88, the patient vomiting occasionally during this time. The patient was kept on a diet consisting of carbohydrates and an abundance of fluids. Later a Minot-Murphy diet was followed. On

August 14, 1927, two days postpartum, the blood pressure was 184/118. The urine showed a faint trace of albumin and a faint trace of bile. There was no leucine or tyrosine present, and these substances were not detected on a subsequent examination.

On August 15, the direct van den Bergh test showed a faint immediate positive, while the indirect showed an immediate positive reaction. On this date the icteric index was still 40, showing no change from the first test. The blood chemistry revealed a nonprotein nitrogen of 41 and creatinine of 1.5. Blood pressure was 160/110. By August 16 the urine was completely negative and remained so.

On August 29, two weeks after admission, the direct van den Bergh test was negative for bile, the indirect showing a faint immediate positive. This finding with the indirect test indicated beginning regeneration of liver parenchyma and restoration of function of bile transference. The icteric index at this time was 15. Blood pressure was 130/80. The blood picture revealed hemoglobin, 70 per cent; R.B.C., 4,200,000; W.B.C., 9,600.

The patient left the hospital on August 30, twenty days after admission, and was instructed to follow a régime at home similar to the one followed in the hospital. Two weeks after her discharge the urine was found negative. The blood pressure was 136/85. Four weeks after discharge the blood pressure was 125/80 and remained so on 3 subsequent examinations at fourteen-day intervals. At the last examination, the patient showed a 12-pound gain in weight over the weight on discharge.

Autopsy of Fetus.—At autopsy the fetus measured 37 cm. in length and weighed 1100 grams. The bones of the skull were very soft, and overriding was present. There was no icterus. The fetus was thin and the liver was palpable considerably below the costal margin. On opening the chest, there was no fluid or adhesions in either pleural cavity. The right lung weighed 18 grams, and the left 15 grams. Each was pinkish blue, firm, noncrepitant, and sank in water. Sections made by cutting revealed very little air and no excess of fluid. The thymus was pink and weighed 2 grams. There were several punctate areas of hemorrhage in the epicardium. The pericardial cavity contained no excess of fluid. The heart weighed 8 grams and was normal except for a few small edematous nodules on the cusps of the mitral valve.

The peritoneal cavity, on opening, contained about 15 or 20 c.c. of blood which was not clotted. The liver extended about 2 cm. below the costal margin, and beneath the capsule there were several areas of bloody exudate. The rest of the liver was bluish. Sections made by cutting were uniformly bluish brown, except in some places in which appeared yellowish punctate areas. The liver weighed 55 grams. The spleen was small, bluish, and weighed 3 grams. No malpighian corpuscles could be made out. The pancreas was small, white, and firm. The kidneys, stomach, and intestines were normal in all respects, the kidneys showing marked fetal lobulations. On opening the scalp an area of hemorrhage was found in the skull. On removing the skull, bloody fluid was found over both cortical areas.

Microscopic Examination: Thymus.—The thymus was divided into lobules which showed a distinct cortex and medulla, and in the cortex there were a number of germinal centers. The cortex was composed almost entirely of lymphocytic cells. The medulla likewise consisted chiefly of lymphocytic cells, but there were also seen a number of large endothelial cells. The medulla was quite vascular. Hassel's corpuscles were not numerous and were almost entirely confined to the medulla and here were seen as red, hyaline-staining pearl-like masses.

Lungs.—The section revealed almost solid tissue, there being very few alveolar spaces, and those present were small and irregular. The alveolar walls were rather thick. The blood vessels were not dilated, and the alveolar lining throughout

the section was composed of cuboidal appearing cells. The bronchioles had a folded appearance and were not completely dilated. The blood vessel walls were slightly thickened. The pleura was quite thin.

Heart.—Section of heart muscle revealed an embryonic form of myofibril, the tissue being pale-staining, the nuclei centrally situated, and no striations being visible. The endocardium was thin and showed no inflammatory reaction.

Liver.—The capsule of the liver was thin, and in one area there was a small degree of extravasated red blood cells present. Throughout the section were innumerable blood-forming islands, so that the entire section appeared filled with these structures, and the cells of the islands for the most part were small with darkly-staining nuclei, but there were also a number of leucocytes. The liver cords were distinct and regular, and the cells stained rather faintly and appeared vacuolated. The sinusoids were dilated and filled with red blood cells.

Spleen.—The capsule of the spleen was thin. The malpighian bodies were numerous but not enlarged; they consisted of lymphocytes and in the center was seen a small blood vessel. The walls of the vessels did not appear thickened. The pulp contained many red cells, lymphocytes, and granules of blood pigment, and appeared somewhat fibrotic. The reticular tissue was easily visible.

Pancreas.—Section of the pancreas showed the organ rather incompletely developed, the acini being small and not fully formed, and the stroma rather thick but not fibrous or dense. The islands of Langerhans were not numerous or large; the cells stained well, and the nuclei of some were large and vesicular, but of others were rather small. The lymphoid tissue adjacent to the pancreas likewise showed embryonic structure.

Adrenal.—Section showed the cortex as fairly dark-staining, but the cells were vacuolated. The cells of the zona glomerulosa were spongy, and the stroma between the cords was very scant. The cells of the zona reticularis were not distinct. In the nodules there were a number of blood vessels.

Kidney.—Section revealed an immature picture of development, the glomeruli deeper in the tissue being well-formed but near the periphery the glomeruli appeared as cords and tubules which were crescentic in shape. The anlage of the glomerular tuft was seen invaginating into some of these tubules. The capsule was thin and smooth, and there was no reaction in the pelvis of the kidney.

Bone.—Section showed a well-formed epiphyseal line in which there was good ossification and no inflammatory reaction.

The testicle.—There was a small section of testicle present, and this showed a fetal type of tissue. The seminiferous tubules were incompletely developed, with absent spermatogenesis.

In résumé the anatomic diagnosis was: Prematurity; subdural hemorrhage over the brain cortex; pulmonary atelectasis; hemoperitoneum; subcapsular hemorrhage of liver.

DISCUSSION

The most widely accepted theory of bile production, according to McNee, credits the cells of the reticulo-endothelial system, either those of the spleen or Kupffer cells of the liver, with the breaking down of hemoglobin and the elaboration of bile pigment. The polygonal glandular cells of the liver have chiefly to do with the transference of bile from the vascular capillaries into the bile capillaries. Aschoff believes that bilirubin in passing through the polygonal cells probably is modified in some way, thus accounting for the two varieties of

bilirubin detected by the van den Bergh test. Van den Bergh, using Ehrlich's diazo reagent, found that a positive coupling with production of the azo dye (azo-bilirubin) can be obtained by adding the diazo reagent direct to the icteric serum. Depending upon the rapidity and density of color, the reaction was termed direct or delayed direct. He also found that after precipitation of the serum proteins with alcohol, icteric serum gives an immediate color with the diazo reagent. The application of the method to these alcoholic solutions gives what is known as the indirect reaction, which may be either immediate or delayed. After examining many sera, van den Bergh concluded that in complete obstructive jaundice, a prompt direct reaction is always obtained, whereas in sera in cases of hemolytic jaundice the direct is negative or at least delayed. Thus, he propounded the theory that the occurrence of an immediate direct reaction meant the presence of bilirubin which passed through the polygonal cells of the liver and was then absorbed on account of obstruction, while in cases of sera giving delayed reaction only, the bilirubin was formed independently of the liver cells and did not pass through them.

Our case is satisfactorily explained by this theory. The liver atrophy caused a destruction of polygonal cells; hence, the bile pigment could not pass through into the bile capillaries and was therefore immediately absorbed into the circulation. The test showed an immediate positive with the indirect, and, since some passed through the remaining healthy polygonal cells, a faint positive with the direct van den Bergh test.

We wish to emphasize that jaundice in liver atrophy is not directly due to necrosis and absorption per se, but rather to a functional disturbance in which the liver cells are not able to transfer the pigment which is normally present.

When our patient had clinically recovered, with a return of the icteric index to 15, the direct van den Bergh was negative for bile, while the indirect showed a faint immediate positive. This would indicate that regeneration of the liver parenchyma had reached a degree sufficient for the polygonal cells to transfer the bilirubin into the proper bile canaliculi.

REFERENCE

- McNee: Quart. J. Med. 16: 390-420, July, 1923.
310 SOUTH MICHIGAN AVENUE.

CARCINOMA OF THE OVARY AFTER THE MENOPAUSE ASSOCIATED WITH RECURRENCE OF UTERINE BLEEDING

BY ABRAHAM STRAUSS, M.D., F.A.C.S., CLEVELAND, OHIO

(From the Surgical Service, Mt. Sinai Hospital)

CARCINOMA of the ovary may occur at any age. It is very rare before the age of twenty, uncommon up to the age of forty, and its greatest frequency is between the ages of forty-five and sixty. It is well to note, however, that it is more common after the menopause than before the age of forty. Döderlein's series showed there is an appreciable number of them in the third decade, and they reach their maximum in the second half of the fifth decade. In Byron and Berkoff's series 26 (48.2 per cent) were past the menopause. Massabuan and Etienne classified 120 cases to show the occurrence of the growth with relation to the genital period. They found 13 occurred before puberty, 69 during the menstrual life, and 38 in the menopause. They noticed no relation between cancer of the ovary and the age of the first menstruation or between cancer of the ovary and irregularities of menstruation.

In contrast to carcinomas, sarcomas of the ovary reach their peak in numbers in the second decade, whereas endotheliomas and peritheliomas occur rather evenly throughout life and are only a little more frequent in the fifth decade.

The frequency of ovarian tumors, both benign and malignant, and the relative ratio of each kind to the whole may be seen from figures of a few clinics. Byron and Berkoff found carcinoma of the ovary in 0.27 per cent of 29,844 gynecologic patients. In Döderlein's clinic from 1907 to 1922 there were 15,000 gynecologic cases among which were 800 instances of ovarian tumors. Only 82 of these were malignant or 10 per cent of all ovarian tumors or 0.5 per cent of all gynecologic cases. Lippert found tumors of the ovary were malignant in 15.5 per cent of his 638 patients, while the figures from other clinics range as high as 37 per cent (Debarenditta and Zardin).

There are two classes of primary carcinomas of the ovary: the one is a tumor that is malignant from the onset, the other includes those malignant tumors that develop in an already existing benign growth, usually a cystadenoma. Stübler and Brandess gave an extensive report of 682 ovarian tumors in 670 patients. Among these there were 134 (19.6 per cent) who had primary carcinoma, 33 patients had metastatic carcinoma, besides 22 who had sarcoma, 2 who had endothelioma, and 1 a teratoblastoma. Sixty-nine or more than one-half of the 134 primary carcinomas above mentioned were due to malignant degeneration of cysts.

It may be well to note further the occurrence of these primary carcinomas in relation to the menopause. In the last mentioned series the number of primary malignant adenomas and solid carcinomas of the ovary that developed after the menopause (being 35) was nearly equaled by the number of cystadenomas that took on a malignant phase after the menopause, namely, 29.

The early conception of the origin of malignant tumors of the ovary was that they were primary or existed simultaneously with other tumors of the body. Pfannenstiel, Rokitsansky, and Billroth were among those who subscribed to this idea and stated that the metastatic tumor of the ovary was exceedingly rare. This opinion was evidently due in great part to the rapid growth of the tumor in the ovary, where it attained such great size that it overshadowed any other lesion. Thus, it often happened that the primary growth was not observed until the postmortem examination. This old theory was upset by Schlagenhauser in 1902 and now the general view is that when carcinoma of the ovary and of another organ exist at the same time, the growth in the ovary is probably secondary to the other. Figures show that only 20.75 per cent of all ovarian carcinomas are metastatic.

Metastases to another organ from the ovary are rare. Of course it is always possible that both may be primary and have no relation to each other, but this must be most unusual. Involvement of the uterus by a tumor of the ovary is usually by direct extension and not by metastases.

The question of fertility of women with ovarian tumors is an interesting one. Of all ovarian tumors that are a complication of pregnancy, somewhere between 0.46 per cent (Siegel) and 6.6 per cent (Jetter) are malignant. Of 64 malignant tumors of the ovary that arose after the menopause, as above cited, whether primary or the result of malignant change of an already existing tumor, 18 patients were sterile, as compared with 33 patients with metastatic tumors of which only one was sterile. Thus, there seems to be some factor of an ovary that is to become malignant which is incompatible with pregnancy. This is all the more striking because the average age of the former group is older than that of the latter. The 18 cases of sterility with primary malignancies were nearly evenly divided into two groups; the one consisting of adeno- or solid carcinoma numbered 8, and the other consisting of malignant degeneration of cystic adenocarcinoma numbered 10 (Stübler and Brandess).

There seems to be nothing typical or suggestive in the symptoms of carcinoma of the ovary. The onset is insidious, usually with pain in the lower abdomen or back or both. The pains may radiate down the legs. The pains may be mild and vague, or start suddenly and be

severe. Digestive disturbances and constipation are frequent and occasionally dyschesia is noted. Often the first symptom is gradual but steady increase in size of the abdomen. If the increase is rapid, it may be accompanied by severe digestive disturbances. Ascites usually accounts for much of the increase. Loss of weight and weakness, shortness of breath on exertion, and urinary frequency usually follow the above complaints. Some patients may show no symptoms, and the tumor be discovered accidentally. The early signs are pain, menstrual disturbances, and rarely disturbances in the general health. Amenorrhea, irregular menses, and menorrhagia have been noted. Irregularity is most common, and metrorrhagia is more common than excessive menstrual flow.

Examination reveals the usual signs of ovarian tumors, such as enlarged abdomen, sometimes more on one side than on the other; ascites, and a tumor mobile or immobile and easily palpable on bimanual examination. The uterus is small and may be displaced upward or to one side, depending on the location and size of the ovarian tumor. This condition has often been mistaken for benign ovarian tumor, tuberculous peritonitis, or uterine tumor.

Lippert and Glockner were the first to call attention to the recurrence of bleeding from the uterus after the menopause in cases of carcinoma of the ovary. Stübler and Brandess observed 2.4 per cent of all ovarian carcinoma cases had recurrence of bleeding.

Schiffman reports in detail 5 patients varying from fifty-three to seventy-one years of age in whom bleeding recurred from three to eighteen years after the menopause. One patient, aged sixty, was a virgin.

The patients I wish to report come in the same group as these reported by Schiffman.

The first was seventy-four years old. Her mother died at the age of eighty-five of carcinoma. The patient had had a plastic operation performed on the urethra for incontinence which had troubled her for from twenty-five to thirty years. Her menopause occurred at fifty-five. Her present complaint was lower abdominal pain which had been present for three or four months, especially on the left side where she noticed a mass that was getting larger. About three months before my visit she had a hemorrhage through the vagina and had spotted some since. She had had no discharge and no offensive odor. At times the pain radiated down the left leg.

Examination showed a fairly well-nourished, elderly lady, weighing 148 pounds. Bimanual examination showed a large irregular rounded mass about 6 inches in diameter, filling the left half of abdomen. It was quite firm, but in parts felt cystic and seemed to extend to a small mass on the right side. The uterus was made out with difficulty; it was separate from the mass, small and pushed forward. A sound introduced into the uterus went into the cavity a little less than 3 inches, confirming the evidence gained by palpation. Heart and lungs were essentially negative. R.B.C., 5,600,000; W.B.C., 8,000; hemoglobin, 80 per cent. Urine was negative.

Operation July 2, 1926 consisted of bilateral salpingo-oophorectomy and supravaginal hysterectomy. The carcinomatous ovary, tube, and uterus were removed first, and then the tube and intraligamentous cyst on the opposite side were excised. There was ascites present.

Convalescence was uneventful. X-ray treatments to the pelvis were started two weeks after the operation.

Pathologic report by Dr. B. S. Kline. Ovaries and uterus (the rest omitted). *Gross description:* Specimen consists of ovaries and fallopian tube; uterus amputated above cervix.

One ovary about 12 by 8 by 9 cm. presents a striking picture. It is apparently a cyst almost entirely filled with fleshy-firm, grayish-white masses. In places the grayish-white masses are observed extending not only into the capsule but through it. There is no appreciable necrosis of the tumor tissue.

The opposite ovary is composed almost entirely of a thin-walled cyst about 8 cm. in diameter. In one portion there is a small amount of ovarian tissue observed.

Uterus: Slightly enlarged. One section shows the chambers somewhat dilated. The endometrium shows numerous areas of hemorrhage at the surface. The blood vessels toward the perimetrium are more prominent than average. In places in the wall there are structures suggesting fibromyoma, not encroaching on the endometrium.

Microscopic Description; Tumor of the Ovary: Section shows typical papilliferous cystadenocarcinoma, with finger-like masses of stroma resembling ovarian tissue, lined by columnar epithelium, in many places heaped up, in many places unbounded by basement membrane and extending into the regional stroma.

Section 2 shows extension of the tumor tissue through the wall of the cyst with epithelial masses apparently within lymphatic channels. There are a moderate number of mitotic figures throughout the tumor tissue. In some areas the tumor has a glandular appearance.

Uterus: Section shows no appreciable abnormalities of endometrium although the glands are irregular in shape. In the wall there is a portion of typical fibromyoma with no degenerative changes. Adherent to the perimetrium there are tags of fibrous tissue.

Final Diagnosis: Papilliferous cystadenocarcinoma of the ovary, 12 cm. in diameter, with simple cyst opposite ovary. Chronic salpingitis (slight), with moderate hydrosalpinx. Fibromyomas of the uterus, few (small).

In November, 1927 the patient had a recurrence in the left pelvis. The mass was about 2 inches in diameter, movable, rather firm, and slightly tender. There was a serosanguineous discharge from the cervical stump. She had further x-ray therapy to the recurrent growth and radium was inserted into the cervical stump to control the bleeding and discharge there. The latter aim was accomplished, but the growth is now growing and the patient is losing ground rapidly.

Through the kindness of Dr. W. H. Weir I was able to examine the records of patients with carcinoma of the ovary operated upon on his service at Lakeside Hospital, Cleveland. From 1914 to 1928 there were 23 such patients, one of whom was colored. Of these there were 6 who had passed the menopause and only one of the six had a recurrence of uterine bleeding.

She (B. S.) was a spinster seventy-one years of age. Her symptoms were of six months duration and consisted of a drawing pain in the lower abdomen; a fullness of the entire abdomen, especially on the right side; rather marked indigestion

and constipation; tenderness in the lower abdomen, and finally vaginal bleeding, at times profuse and at other times scanty.

On examination a tumor mass filling the right lower abdomen was made out, as well as ascites.

Operation consisted of oophorectomy.

Pathologic Report; Gross: Specimen consists of tumor mass about 25 by 18 by 15 cm. There are large nodules of tissue adjoining one another, in some places translucent, in others, opaque, yellow-white. On section, the walls of the cyst are studied with translucent tissue varying from a few millimeters to 4 or 5 cm. in diameter. The content of the cyst is mucus, sometimes gelatinous. Microscopic examination shows large irregular acini, small cysts lined by columnar epithelium of either simple or stratified type. Acini contain granular debris and mucus. Stroma is congested. Other sections show greater proliferation of epithelium, but still an irregular papilliform arrangement.

Diagnosis: Papillary cyst adenocarcinoma of ovary.

Schiffman points out that these cases are of practical clinical and theoretic interest. The first question Schiffman raised is how often is postclimacteric bleeding with negative findings a sign of carcinoma of the ovary.

The importance of this will be readily grasped if one agrees that early operation is the best means of curing cancer. Stübler and Brandess gave 76 per cent as the death rate from recurrences in the first year and 15.5 per cent in the second year. Three of Schiffman's cases were negative to bimanual examination, even under ether anesthesia. A slight enlargement of the ovary was made out in the fourth under anesthesia, and the fifth developed malignancy in a preexisting tumor. No surgeon, therefore, can pass lightly over a patient who complains of bleeding after the menopause even with negative findings. It is a question whether an exploratory operation is indicated when the examination is negative, but it certainly is if a slight enlargement of the ovary is made out, and all patients with bleeding recurring after menopause without demonstrable cause in the uterus should be suspected of harboring a carcinoma of the ovary.

Unlike cancer of the uterus the bleeding in malignant tumors of the ovary is slight and as a rule of short duration. In fact it passes off so quickly that the patient does not pay so much attention to it as with uterine malignancy and thus valuable time may be lost. Furthermore, although uterine bleeding may be present in carcinoma of the ovary, there is no foul discharge such as occurs with carcinoma of the uterus. As in Lahm's case it may simulate exactly a normal menstrual period.

The treatment, of course, is radical removal including the uterus. All statistics show the best results when hysterectomy was performed with bilateral oophorectomy. The danger of leaving one ovary is seen in reports of recurrence of malignancy in the ovary left at the first operation. Strassman has made a report of the results of his treat-

ment of 66 cases of malignancy of the ovary of which 52 were carcinoma. In only 4 was the growth limited to the ovary. Thirty-two of the cases had no postoperative radiation. Ten lived but one month, 5 lived for six months, 6 for ten months, 2 for fourteen months, and 9 were untraced. Of the 20 that were given postoperative radiation 2 lived for two months, 3 for five months, 2 for one year, 6 for two years, 2 for two and one-half years, and 2 had already passed the six year mark. This small series is favorable to postoperative radiation.

Furthermore it is obvious, from a study of ovarian tumors, that one cannot tell from the early clinical picture whether an ovarian tumor is benign or malignant or whether a benign tumor will assume a malignant character. In fact it has been pointed out that the pathologic picture and the clinical course do not always coincide. It is safe to say, therefore, that every ovarian tumor should be removed when it is diagnosed, and if malignant the opposite ovary should be removed at the same time, usually with the uterus. Hunt and Simon removed the malignant ovarian tumor only, in their patient, an infant of seventeen months, believing that there is not enough evidence to remove more when a malignant ovary is discovered in a patient so young. But in an adult there would be no question.

Theoretically the question remains, what causes bleeding from a senile uterus with a malignancy of the ovary? Fragmentary evidence is at hand which points to some explanation. Halban noted that some tumors of glands of internal secretion had a definite effect on sex characteristics. It has been seen that young girls before puberty with ovarian tumor were fully developed as far as secondary sex characteristics were concerned. The most recent account of such development of secondary sexual characteristics is contained in a report of a carcinoma of the ovary in an infant, aged seventeen months, by Hunt and Simon, and showed an abnormal development of the baby's breast and pubic hair. Furthermore, one month before they examined the baby she had had a slight blood-tinged vaginal discharge, resembling a menstrual flow.

Alessandri mentions the fact that even after complete removal of the thyroid for cancer hypothyroidism is unheard of if metastases are present, because the metastatic tumors function as the thyroid. Thus it may be assumed that the ovarian tumor may take on the function of the original tissue.

Schiffman suggests that the tumor may stimulate latent qualities in the remaining ovarian tissue, but adds, whether the postclimacteric ovary has such latent qualities is not known.

Lahm recently reported his case of a married woman, aged sixty, who began to bleed nine years after the menopause. She had never been pregnant. At operation he found a pseudomucinous cystic adenocarcinoma of the left ovary and a corpus luteum cyst of the right ovary and an adenomatous hyperplasia of the endometrium.

In his discussion he points to this cyst as a probable cause of the change in the uterine mucosa and the bleeding. He leaves open the question why this woman should have a fresh corpus luteum cyst in an ovary that had long ceased to function.

In my first case there was a small amount of ovarian tissue in the opposite ovary which contained a large thin-walled cyst and showed no signs of activity.

SUMMARY

Carcinoma of the ovary is a disease of late adult life.

Patients with primary malignant ovarian tumors show a high rate of sterility.

Removal of all ovarian tumors as soon as discovered should be the rule.

When carcinoma of the ovary originates after the menopause, it may be accompanied by uterine bleeding and rarely may show no other sign. Therefore, postclimacteric uterine bleeding, with no apparent cause, must be regarded as suspicious of ovarian malignancy.

REFERENCES

Massabuan, G., and Etienne, E.: *Rev. de gynéc. et de chir. abd.*, Par. 20: 225, 1913. Döderlein, A.: Zweifel, Payr. *Die Klinik d. Bösartigen Geschwülste*, Leipzig, 3: 105, 1927. Byron, C. S., and Berkoff, H. S.: *AM. J. OBST. & GYNEC.*, 2: 559, 1926. Stübler, E., and Brandess, T.: *Gesamtgebiet d. Med.* 21: 249, 1924. Schiffman, J.: *Zentralbl. f. Gynäk.* 49: 2229, 1925. Strassman, P.: *Sitzungsb. d. Gesellsch. f. Geburtsh. u. Gynäk.* 9, Dec., 1921; *Zentralbl. f. Gynäk.*, No. 13, 514, 1922. Lahm, W.: *Zentralbl. f. Gynäk.* 51: 2743, 1927. Hunt, V. C., and Simon, E. H.: *Ann. Surg.* 87: 84, 1928.

607 OSBORN BUILDING.

Kosakaé, J. *Pharmacologic Research of the Action of Placenta Extract. The Japanese Journal of Obstetrics and Gynecology*, 1928, xi, 27.

The author found that a hydrolytic extract of placenta produces contractions of the uterus in situ just as it does on the removed uterus. The extract also increases the tonicity of the intestines, and this effect is removed by atropine. Respiration is increased and the blood pressure is diminished by the extract, but when the experimental animal is pregnant or has recently given birth, the blood pressure is raised in most instances. As pointed out by Halban, the placenta stimulates the growth of the genitals and the breast glands. While this is true for animals, it does not hold for human beings. The contractions of the uterus produced by placental extract may not be specific because other organ extracts produce the same result. The best results are obtained when the administration of placental extract is combined with a pituitary preparation. The author attributes the results to stimulation of the parasympathetic system.

J. P. Greenhill.

EXPERIENCES IN THE MANAGEMENT OF PREGNANCY COMPLICATED BY HEART DISEASE*

BY HAROLD E. B. PARDEE, M.D., NEW YORK, N. Y.

*(Assistant Attending Physician, New York Hospital; Consultant in Cardiac Disease,
Lying-In Hospital and Woman's Hospital, New York City)*

WHETHER or not to allow a woman with heart disease to go through pregnancy depends upon a prognosis. It demands a decision as to whether or not the heart will be able to supply blood for the physical demands of the later months of pregnancy and especially for the more strenuous effort of the hours of labor.

In the past the diagnosis of the anatomic lesion has been used as a basis for this prognosis, but to judge from the results it is not a reliable basis. Mackenzie pointed the way to a better understanding of the problem by focusing attention upon the symptoms and signs of failure of the heart to maintain a normal circulation. His observations and suggestions¹ published in 1921 were the first direct word from the internist to the obstetrician indicating the marked change in viewpoint which the modern ideas of cardiology have produced.

The prognosis for pregnancy depends upon the functional cardiac diagnosis, and this centers upon the patient's ability to perform physical exertion rather than upon the pathologic state of the valves or myocardium.

In this country and particularly in New York City, the idea of determining the limitations of the patient's heart by observing the reaction to physical exercise had obtained a firm hold, and in 1922 I was able to give the results of two years' experience with a functional classification of women with heart disease which it was hoped would indicate their fitness for pregnancy.² This classification depended upon three factors: First, that the patient definitely had organic cardiac disease; second, the ease with which unusual shortness of breath or palpitation developed after exercise; third, the observation of the patient's reaction to a rather strenuous test exercise given by the physician.

This preliminary report suggested that the method had some value as there was no instance of cardiac failure developing during pregnancy or labor in patients of the two groups considered most favorable. The experience of the last seven years has continued to show the value of a functional rating of the patients with heart disease. A functional classification has been introduced, under the auspices of The New York Heart Association, and this classification has come to

*Read before the Section on Obstetrics and Gynecology, New York State Medical Society, Albany, New York, May 23, 1926.

be widely used in many parts of the country. It seemed inadvisable to have a different classification for those cardiac patients who were pregnant and so the classification of The New York Heart Association has been used in our antepartum clinic at the Lying-In Hospital since 1924. This classification does not differ in principle, but only in the number of groups, from the one which I suggested in 1922. Patients with organic cardiac disease are divided into four classes according to their cardiac functional capacity.

Class I.—Those who are able to perform ordinary and usual physical activity without unusual fatigue, palpitation or dyspnea.

Class IIA.—Those who are able to perform the usual normal physical activity but who have discomfort in so doing. Such a person would have noticed an increase in shortness of breath after climbing stairs or after walking against a wind or up grades or after such things as housecleaning or lifting heavy articles. These patients would by some be said to be "fairly well compensated."

Class IIB.—Those who are unable to perform the more difficult features of ordinary physical activity without stopping on account of fatigue, shortness of breath or palpitation. Such activities would be climbing two flights of stairs or walking at an ordinary rate for a half mile. These patients might be called "somewhat decompensated."

Class III.—Those who are unable to perform the simplest physical activity without fatigue or shortness of breath or palpitation. Such a patient would be unable to walk 200 or 300 feet or to climb one flight of stairs without resting, and would be unable to do any housework. These might be said to be "much decompensated" or "definitely decompensated."

We have attempted to classify our antepartum cases along these lines using the patient's history of her ability to exercise as a guide and checking our rating by the observed reaction to a test exercise when the patient's history seemed unsatisfactory. Due allowance must be made for the normal limitation of ability to exercise which comes with pregnancy. The sickness of the early months may give rise to exhaustion and rapid pulse. In the later months there will be a shortness of breath on climbing stairs, not usually preventing the woman from climbing two flights, but making a pause necessary on the third flight. In doing her housework she finds it necessary to slow her pace somewhat.

Allowance must also be made for the fact that edema of the legs need not be due to heart disease. Many women whose hearts are normal show this during pregnancy.

In rating patients on their cardiac ability not only must these usual limitations of pregnancy be allowed for but also the individual variation found in different women. Some undertake physical effort with greater facility than others. Some women never can do much in the way of exercise but careful inquiry will discover that it is a sense of

fatigue rather than shortness of breath which limits their ability. In the absence of other signs this is not a symptom of cardiac failure.

The test exercise is of considerable help in doubtful cases, allowing the patient to swing a 10 pound dumb-bell, or a 5 pound dumb-bell if she is not well developed physically, from between the legs to straight overhead. She should do this 20 or 25 times, under the physician's observation and he should note the pulse rate and appearance of dyspnea directly afterward. A normal reaction will consist in a moderate amount of dyspnea and tachycardia which will subside in a minute or two. If the patient shows marked dyspnea or tachycardia the reaction is excessive and she should be classed as IIA or IIB. If the patient cannot perform this exercise on account of palpitation or dyspnea the reaction is so excessive that she should be classed as IIB. A Class III patient would probably not be able to perform more than 5 or 6 swings of the dumb-bell, but as a rule a test exercise is unnecessary for the functional diagnosis of a Class III patient. The subjective complaints and the appearance are usually sufficient.

I wish at present to report upon the results with a series of 106 patients seen in the antepartum Clinic of the Lying-In Hospital, between July, 1923, and July, 1925. All of them except two had rheumatic valvular disease and these two had congenital cardiac abnormalities. Twenty-nine were diagnosed as having mitral insufficiency. Sixty-four were diagnosed as having mitral stenosis. Eleven had aortic insufficiency and three of these probably mitral stenosis as well. One of the congenital cases was thought to have patent interventricular septum, the other patent ductus arteriosus. The functional classification of these patients is shown in Table I. Seventy-five were diagnosed as Class I, twenty as Class IIA and eleven as Class IIB. In addition to these 106 patients who were followed from the antepartum clinic, there entered the hospital during this two year period, six other patients with heart disease in a seriously decompensated state, three of them with pulmonary edema. These were Class III patients, five with mitral stenosis and one with aortic insufficiency. These patients appear in the last column of the table. The mortality in this group is striking, but the fact that three of these patients entered with such marked congestive heart failure that edema of the lungs was present shows a reason for this. Had these patients been under antepartum observation, it should have been possible to prevent their heart failure reaching such a severe grade. Their lives might have been saved and possibly also those of their babies.

Cardiac enlargement has been emphasized by some as an important feature for deciding upon the functional ability of the heart and especially the ability of the patient to withstand the strain of labor.

From this series it seemed to be of some importance (Table II) for cardiac enlargement was more than slight in eight (73 per cent) of the eleven patients who were rated as Class IIB, and who were definitely limited by shortness of breath and in only twelve (18 per cent)

TABLE I

	CLASS I	CLASS IIA	CLASS IIB	CLASS IIB
Mitral insufficiency	27	2	—	—
Mitral stenosis	21	8 ^d	6	—
Mitral stenosis and insufficiency	18 ^a	8	3 ^b	5 ^c
Aortic insufficiency	3	1	—	—
Aortic and mitral insufficiency	3	1	—	1
Aortic insufficiency and mitral stenosis	1	—	2	—
Congenital abnormality	2			
Total	75	20	11	6

^aOne died of pneumonia after hysterotomy for dystocia.

^bOne died of heart failure after hysterectomy for heart failure.

^cTwo died soon after admission, another after treatment for forty days followed by vaginal section.

^dOne died after operation for gangrene of leg due to embolus of popliteal artery.

of the 64 patients who were rated as Class I, and who had no symptoms referable to their hearts. Class IIA patients who had slight symptoms of cardiac insufficiency showed definite cardiac enlargement five times in nineteen patients (20 per cent).

It will be seen from Table II, however, that enlargement is not a reliable guide. There were two patients with marked cardiac enlargement and this means the apex beat almost at the anterior axillary line, who yet had no symptoms referable to the heart (Class I), and ten patients with moderate cardiac enlargement were also in this category.

TABLE II

CLASS	ENLARGEMENT SLIGHT OR ABSENT			ENLARGEMENT MODERATE			ENLARGEMENT MARKED		
	I	IIA	IIB	I	IIA	IIB	I	IIA	IIB
Mitral insufficiency	19	2	—	3	—	—	—	—	—
Mitral stenosis	18 ^a	5	2	2	2 ^c	2	—	—	2 ^b
Mitral stenosis and insufficiency	13	7	1	1	—	2	1	1	—
Aortic insufficiency	1	—	—	1	—	—	1	1	—
Aortic and mitral insufficiency	1	—	—	2	—	—	—	1	—
Aortic insufficiency and mitral stenosis	—	—	—	1	—	—	—	—	2
Total	52	14	3	10	2	4	2	3	4

^aOne died of pneumonia after hysterotomy for dystocia.

^bOne died of heart failure after hysterectomy for heart failure.

^cOne died after operation for gangrene of leg due to embolus of popliteal artery.

The experience with this series gives added weight to the idea that a functional diagnosis of the cardiac patient is the most satisfactory available guide to the prognosis for pregnancy. To show the reasons for this it will be necessary to review in detail the case histories of the patients who died and in general the histories of those in the four functional groups.

Of the 75 patients diagnosed as Class I, 60 entered the hospital for delivery. There was no record of cardiac embarrassment during labor. One of these Class I patients died of pneumonia following a cesarean operation. This patient did not enter the hospital until labor had been in progress thirty-two hours. A hysterotomy was promptly done and the child found dead. No evidences of cardiac embarrassment were observed either before or after the operation. She developed pneumonia on the day after the operation and died on the fifteenth day.

Of 19 patients diagnosed as Class IIA, twelve entered the hospital for delivery. Five of these went through perfectly uneventful labors without noteworthy acceleration of the pulse or respiration. Three women showed slight pulse and respiration increase during and after labor with a varying amount of subjective dyspnea. All, however, made a prompt and uneventful recovery usually within twenty-four hours. One of these, para iv, after twenty-six hours in the first stage and two hours in the second stage, showed a pulse of 108 and respiration 22, with no subjective dyspnea. Another, a para v, had five hours of first stage and thirty-five minutes of second stage. She had a pulse of 118 and respirations 24 and complained of slight subjective dyspnea. The other, a para ii, breech delivery, had three hours and a half of first stage and fifty minutes of second stage. The pulse was 120, the respirations 22 and she complained of slight dyspnea.

Three were helped through the second stage by forceps after a long first stage, but showed no especial evidence of cardiac embarrassment. One of these, para iii, after twenty-five hours first stage and two hours second stage and a median forceps application, showed the pulse 104, respiration 22; another, para i, after fifteen hours first stage, four hours second stage, and a low forceps application, showed pulse 100, respiration 20; the third, para i, after sixteen hours first stage, one-half hour second stage and a median forceps application, showed pulse 100, respiration 20.

One woman with moderate nephritic manifestations, and hypertension as well as mitral stenosis, had a spontaneous premature delivery at the sixth month and during this showed the pulse 120 and respiration 28 with some dyspnea. In about thirty-six hours the pulse and respirations had returned to normal and she made an uneventful recovery. Another, a para xii, after a short labor without unusual pulse or respiratory acceleration, showed fever for a week and had occasional attacks of cyanosis and weak pulse during this time. A definite diagnosis was not made but pulmonary embolism was suspected.

One patient was delivered at another hospital.* She entered in labor and after a low forceps application was delivered of a four pound baby. The pulse and respiration were only slightly accelerated and she seemed in good condition. She had, however, cough and some dyspnea at night for a few days but improved and was allowed up in a chair on the tenth day postpartum. Next day she complained of a pain in the right leg and six days later gangrene of the leg was diagnosed and the leg was amputated for embolism of the popliteal artery. She did not make a good postoperative recovery and died on the twenty-sixth day postpartum.

Of eleven patients diagnosed as Class IIB, nine entered the hospital for delivery. Three of these went through without event; another had slight cardiac embarrassment. She was a multipara with twenty-seven hours in the first stage and two hours in the second, who showed the pulse 105 and the respiration 24 with slight subjective dyspnea. She made a prompt recovery, however, and was discharged in good condition. Another, after nine hours in the first stage and a version and breech extraction, showed no cardiac embarrassment but had postpartum hemorrhage with a pulse of about 100 for three days.

Two patients diagnosed as Class IIB in the clinic were later admitted to the hospital severely decompensated (Class III), one in the fifth month of pregnancy, the other in the third month. Both improved somewhat with rest and digitalis. The first patient who had entered with marked pulmonary congestion was operated on after fourteen days of treatment. Hysterectomy was followed by death on the second day. The second patient who had entered at the third month of pregnancy with only slight pulmonary congestion, had a hysterectomy on the ninth day and made an uneventful recovery.

Two patients were delivered by the cesarean operation, one after eighteen hours and the other after twenty-four hours of labor without progress. Both of these showed slight signs of circulatory embarrassment in an increase of pulse to about 120 and of respiration to 28.

Reviewing the results with these patients we find that the only deaths from heart failure occurred in the patients of Class IIB or Class III. The death in Class IIA was also a result of the heart disease and probably would not have occurred if she had not undergone the pregnancy. The death in Class I was a postoperative pneumonia and probably did not bear any definite relation to the heart disease.

Half of the twelve Class IIA patients went through labor with only the slightest signs of cardiac strain, as did five of the seven uncomplicated Class IIB patients. No patient diagnosed as Class IIA in the clinic entered the hospital severely decompensated as did two of the Class IIB patients. The two patients who had the cesarean operation

*The Lebanon Hospital, whose superintendent, Mr. G. E. Halpern kindly allowed the chart to be abstracted.

had a long period of labor before it in each case, and they stood the operation very well indeed. In one case the operation was done under local anesthesia.

There was a striking difference between the reaction of the women in Class I and those in Class II, A and B. The Class IIA patients appeared to have less cardiac distress on the average than did those in Class IIB, but individuals in either group showed so little reaction to the labor that it was hard to feel that their cardiac condition was variably severe.

One great difficulty in predicting the effect of labor lies, as has been said before,³ in the inability to predict the duration and severity of the strain of labor. With a short first stage and a short second stage, perhaps assisted by a low forceps application, there may not be much physical strain imposed on the heart. A long second stage is a severe strain on the heart. A much weakened heart might withstand a short second stage successfully, and a less weakened heart fail during a long one.

The seriousness of the occurrence of severe cardiac failure during pregnancy or labor is evident from the fact that of six patients in this condition, two died. The best treatment of severe cardiac failure is prevention and this means keeping watch during pregnancy for the appearance of increasing cardiac difficulty, appropriate treatment of the heart as soon as this is discovered and the interruption of pregnancy if the heart fails to respond to treatment after two or three weeks. If the woman goes into labor and during labor shows a pulse of 115 or respirations of 28 with subjective dyspnea or both of these, the condition should be considered as an emergency and any appropriate means applied to expedite delivery. In each case the obstetrician must decide what will combine the utmost speed with the minimum of cardiac strain. If an anesthetic is necessary, gas should be especially avoided, for this increases cyanosis and thus aggravates one of the symptoms of heart failure. Chloroform or ether is very well borne.

As a method of interrupting pregnancy, the cesarean operation has seemed to produce very little additional heart strain and to be preferable to hysterectomy from this viewpoint. This is especially so if the operation can be done with local anesthesia.

On the whole the grouping of these patients according to cardiac functional capacity seems to have a distinct value in helping to give a prognosis for pregnancy. A Class I patient will not be expected to give trouble from cardiac insufficiency. A Class IIA patient will probably not give trouble but there is a fair chance that a Class IIB will do so. The management of the Class III group is extremely diffi-

cult and the mortality is high. The main object of our antepartum cardiac observation is to prevent the patient ever becoming so severely decompensated as to fall into this group.

REFERENCES

(1) *Mackenzie, Sir J.*: Heart Disease and Pregnancy, Oxford University Press, London, 1921. (2) *Pardee, Harold E. B.*: J. A. M. A. 78: 1188, 1922. (3) *Pardee, Harold E. B.*: Am. J. M. Sc. 164: 847, 1922.

160 EAST SIXTY-FOURTH STREET.

A MODIFICATION OF THE CLASSIC FORCEPS AND ITS APPLICATION

BY SAUL SEIDES, M.D., F.A.C.S., BROOKLYN, NEW YORK

IT IS generally recognized that force, excessive or misdirected, spells injury to the maternal soft parts and the fetal head. Injuries to the mother and baby may be caused also by an instrument which is ill-fitting or poorly constructed. The selection of the proper instrument for a given case is essential in order to obtain the best results.

The types of classic forceps in general use show marked variations in the extent of the pelvic and cephalic curves, the length of the blades, and the size of shanks and handles. They have the English lock so that when they are articulated and the handles approximated the space between the blades becomes irreducible. Because of these features the classic forceps can make a proper fit only with a head of definite size and shape.

The Kielland forceps has aroused a great deal of interest and discussion among obstetricians. Opinions differ as to its range of usefulness, advantages, and dangers. While it is in great favor with some, others, because of its tendency to encourage the "high forceps operation," unreservedly condemn it. The Kielland forceps is essentially a straight forceps, primarily designed for inlet applications. When the head is deeply engaged or stationed at the outlet the classic forceps with its full pelvic curve and shorter blade has the advantage over the Kielland forceps of conforming to the curve of the pelvic axis, and of avoiding undue strain and premature distention of the perineum. However, the narrower blades, the convex cushion-like inner surfaces, and the sliding lock of the Kielland forceps are factors that tend to minimize injuries to the maternal soft parts and fetal head, and contribute to the safety of instrumental delivery.

It occurred to me that a modification of the classic forceps which included the sliding lock and the other features above mentioned would furnish an instrument capable of greater advantages and bet-

ter results. Accordingly, I designed and had constructed the model described below. For the last two years I have used the new instrument almost exclusively with utmost satisfaction.*

The instrument is 38 cm. long. It has the full pelvic curve of the classic forceps; the distance of the apex from the horizontal is 7 cm. The widest diameter of the cephalic curve, when the forceps is locked and the handles parallel to each other, is $9\frac{1}{2}$ cm.; and the distance between the apices is $2\frac{1}{2}$ cm. The inner surfaces of the blades are slightly convex and the edges are well rounded. The lock is of the "sliding" type and is located slightly below the center of the shank of the left branch. The handles are so connected to the shanks that when the forceps is locked, there is a space of $1\frac{1}{2}$ cm. between them. The shoulders, at the junction of handles and shanks, are concave and comfortably accommodate the fingers of the operator.

The introduction of the blades is performed in the usual classic way. The articulation is easily accomplished even when the blades are not on the same level, as occurs in cases where the head is in the

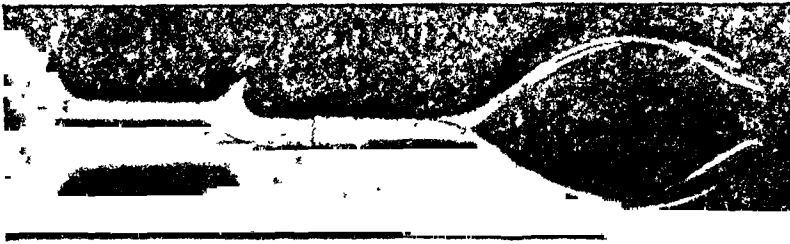


Fig. 1.

oblique position or where asynclitism is present. If this condition exists, no attempt is made at this time to correct it. As soon as traction is applied and the head straightens, the sliding lock permits the blades to shift and assume the proper level.

The extraction is conducted as follows: the right hand gets a purchase on the instrument in such a manner that the handles rest on the palm of the operator, the shank lying between the index and the middle fingers which are hooked over the shoulders. No compression of the handles with its obvious disadvantages is thus possible. Two fingers of the left hand (middle and index) are placed on the shanks to reinforce the right hand and also to direct the pull in the axis of the pelvis in the manner of Pajot's maneuver. When the operator releases the instrument, the handles automatically separate, thus avoiding compression of the head during the interval between tractions.

After the head has passed the bony outlet, its delivery over the perineum is conveniently accomplished by grasping the shank with the right hand so that the shoulders rest against the base of the thumb and index fingers, and directing the pull forward and upward. When the

*This instrument is made by Geo. Tieman & Co., New York.

wide diameter of the head reaches the vulval-orifice the forceps are disarticulated and removed, and the head is allowed to be born spontaneously.

The advantages of the new model:

1. The pelvic curve of the forceps which conforms with the curve of the pelvic axis is of recognized advantage in medium and low forceps operations.

2. The sliding lock permits the widest diameter of the blades to be in steady contact with the largest diameter of the head. The head is held securely by the blades and slipping of the latter does not occur. It is also helpful when the head is in the oblique position and in asynclitism.

3. The special arrangement of the handles allows a snugly fitting application to a small head. By converging the handles the space between the blades can be reduced to any required extent.

4. Forceps-flare in advance of the descending and emerging head is negligible. Premature distention and undue strain of the perineum is thus obviated and the danger of lacerations of the soft parts is lessened.

4510 TWELFTH AVENUE.

A NEW DEVICE FOR PERFORMING MEDIAN EPISIOTOMY

BY WILLIAM A. MICHAEL, M.D., PEORIA, ILLINOIS

THE device, hereinafter described, suggested itself as a means of facilitating essentially painless median episiotomy in the perineal stage of labor when delivery is to be spontaneously accomplished, indication for perineal incision is present, and anesthesia is short of the surgical degree. Thus it will be seen that the field of usefulness for this instrument embraces a goodly percentage of spontaneous deliveries in primiparae and in many multiparae who have had previous perineal injury and repair. Lest a mistaken impression be gained, it should be stated clearly that this knife, with guard attached, is not recommended for perineal incision to the entire exclusion of scissors, for the latter are firmly intrenched for use in this connection, and cer-

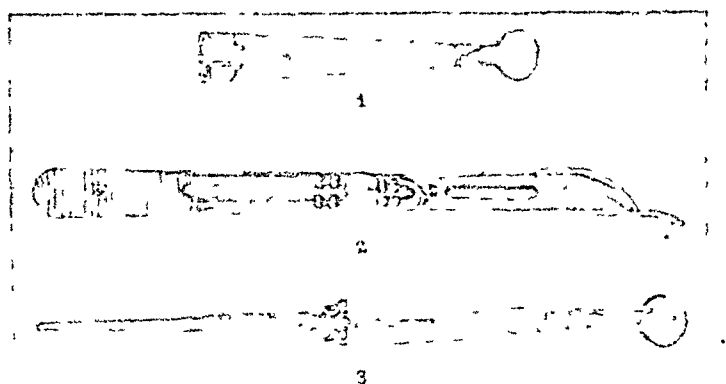


FIG. 1.—1, Anterior view of the knife protector. Additional spring effect is secured by the slot at the proximal end. 2, Side view of the assembled knife. 3, Posterior view of the assembled knife; this being the surface which comes into apposition with the advancing fetal head.

tainly should be used when anesthesia is complete and operative delivery is contemplated.

This knife protector or guard attaches to the Bard-Parker knife (number four handle and any of the blades 20, 21, 22, 23), and is made of a specially hardened phosphorus bronze material. It fits the knife snugly by means of spring clips attached to both handle and blade; the latter in such a fashion that the cutting edge is not encroached upon, as will be seen by reference to the illustration. While any of the above-mentioned blades may be used, experience has shown that the number twenty-two blade is preferable, owing to its larger and more rounded belly. At this point it should be emphasized that the reason for fitting this attachment to a standard knife with removable blade is to make constantly available a fresh, keen, cutting edge such

as is not afforded by the ordinary scalpel or scissors. With a dull blade the original purpose is defeated and the knife is practically devoid of merit.

With respect to the manner in which the assembled instrument is used, it can readily be seen by reference to the illustration that the tip is inserted within the vagina between the on-coming head and the distended perineum in such a manner that the blade is directed outward and downward. The knife is controlled with one hand while the other controls the head to prevent too rapid expulsion. The pressure of the head against the knife protector, together with a sweeping motion imparted by the knife hand, is utilized to make the incision, which is enlarged slightly with each successive contraction until the opening is sufficiently large to allow passage of the head without additional laceration. At times it may and does prove expedient to make the incision with a single sweep of the knife. Moreover, as the incision reaches the anal region and additional enlargement is required, it may be directed to one side without difficulty; in this event, anesthesia should be deepened as pain is experienced when the incision is carried away from the midline. It is for this reason that the knife cannot be employed in making lateral incisions unless complete surgical anesthesia is first induced. Pituitary liquid may or may not be used during the actual expulsion as seems indicated.

In a trial period extending over eight months this method has found a fairly liberal application by myself and by my colleague, Dr. William Cooley, and for a shorter period of time, by Dr. G. D. Royston of St. Louis. It has been used on patients who have received morphine-scopolamine, morphine-magnesium sulphate-ether, and the several inhalation anesthetics. Its advantages are that a keen cutting edge is always available; that perineal incision is accomplished under lighter anesthesia; that it is applicable in instances where insufficient room is available to permit the finger to act as a guard between knife and head; that trauma of tissues by the crushing action of scissors is obviated; that the wound possesses the virtues now quite generally ascribed to the median incision however made, namely, ease of repair, less postoperative discomfort and better anatomic result; and finally, that as a result of the lighter anesthesia required and consequent non-interference with orderly uterine contractions, the incidence of the low forceps operation is very materially reduced.

I wish to express my appreciation to Mr. V. Mueller, of V. Mueller and Company, Chicago, for his active interest in developing the finished protector from the original model submitted.

800 PEORIA LIFE BUILDING.

Society Transactions

CHICAGO GYNECOLOGICAL SOCIETY

STATED MEETING, APRIL 20, 1928

ABSTRACTS OF CASE REPORTS AND DISCUSSIONS

DR. MASSEL reported a case of Abscess of the Wall of the Uterus with Hemolytic Streptococcus.

Mrs. —, aged thirty, widow, white, was admitted to Dr. Baer's Service at the Michael Reese Hospital, Feb. 16, 1928. The patient was entirely well until about two weeks prior to admission when she rather suddenly developed a pain, dull and aching in character, in the right lower quadrant of the abdomen. This disappeared completely in two days, and was soon followed by sharp, knife-like pains in the left side with vomiting, 4 or 5 times within three or four hours and on the evening and morning before admission. Patient further stated that she had a "little" fever and chilly sensations, that her appetite was poor, that she was somewhat weak, and that there was some burning on urination but no frequency or nocturia, for the past two weeks. Bowels were undisturbed. Periods were always regular, twenty-eight-day type, lasting three days, moderate flow, and the last period was Feb. 1, 1928. She had one pregnancy in 1915 with a normal delivery and puerperium. The only illness recollected was measles when a child. She was never operated upon before. The remainder of the history was unimportant.

Physically, patient was a short, fairly well-nourished woman, who appeared to be acutely ill, with temperature, 99.8° F.; pulse, 104; respiration, 24; W.B.C., 8,800; sedimentation time, 15 min.; hemoglobin, 75 per cent; R.B.C., 3,730,000; blood pressure, 124/80. The abdomen was slightly tender in the right lower quadrant and markedly tender with increased muscular resistance in the left lower quadrant and otherwise negative. Cervix was high, firm, had many small lacerations, and was slightly resistant to motion. Corpus was anteфлекed, firm, deviated to the right, and movable; right adnexa negative. A mass was felt to the left and behind the corpus, which was nodular, firm, extremely tender and moved with the uterus. The impression before operation was solid adherent tumor of the ovary with hemorrhage.

At operation the solid tumor proved to be a sessile fibroid, three centimeters in diameter; the left tube and ovary appeared acutely inflamed, and the sigmoid was adherent to the uterus just beneath the base of the fibroid. A subtotal hysterectomy, left salpingectomy and oophorectomy, and plastic on the denuded sigmoid were done. Dissection of the uterus revealed an intramural abscess about two centimeters below the left tubal cornu and at the point at which the sigmoid was adherent. The abscess was about a centimeter and a half in diameter.

Patient made an uneventful recovery, except for a small skin stitch abscess, which cleared up quickly; a slight vaginal discharge, which disappeared on the eighth day postoperatively, and the necessity for catheterization twice daily for thirteen days after the operation. Patient was discharged from the hospital on the twentieth postoperative day in excellent condition.

Cultures of the pus from the abscess cavity of the wall of the uterus showed the presence of the hemolytic streptococcus.

DISCUSSION

DR. J. L. BAER believed that some intrauterine manipulation preceded the development of this abscess, that an inoculation with streptococci accompanied this instrumentation and that the adhesion between the wall of the uterus and the sigmoid was a defensive reaction on the peritoneal side. He had expected to find colon bacillus in the uterine abscess, thinking it was a perforation of a sigmoid epiplocele. The presence of streptococci in pure culture seemed to justify the above-mentioned portal of entry.

DR. CAREY CULBERTSON said that the intramural abscesses reported in recent years have been described as infections during labor or the puerperium. Some years ago he saw an intramural abscess that was a real abscess of the tube, associated with gonorrheal salpingitis. At that time he also reported an intramural abscess that was found at autopsy in an elderly woman who died of diabetes and in association with the diabetes she had a large carbuncular abscess of the neck. Since that time he has seen one other intramural abscess in the horn of the uterus in association with gonorrheal pus tubes. Intramural abscesses seem in recent years to be exceptionally unusual.

J. E. MARKEE (by invitation) presented a paper on **Rhythmic Variations in the Vascularity of the Uterus of the Guinea Pig During the Estrous Cycle**. (For original paper see page 205.)

ABSTRACT OF DISCUSSION

PROFESSOR H. B. VAN DYKE said that one remark made by Mr. Markee is important: namely, that he had noticed no change in the size of the blood vessels. The procedure described supplies additional means not only of studying the influence of the ovarian hormone but of learning more of the physiology of the uterus. With respect to the estrus producing ovarian hormone, it is of course well known that uterine hypertrophy occurs after injection of this hormone into spayed animals; Mr. Markee's method makes it possible to follow such changes from day to day.

Observations can also be made on the pharmacology of the uterine mucous membrane without anesthesia which is responsible for more artefacts than is commonly realized. For example, the effects of epinephrin, pilocarpine, and atropine on the transplanted uterine mucosa can be studied. Such studies might also be of considerable general interest and supplement those which have been made of the visible mucous membrane.

PROF. G. W. BARTELMEZ said that those who are acquainted with the variations in the peristaltic contractions of uterus and tubes during the estrus cycle will appreciate the similarity between them and the vascular changes described by Mr. Markee. Both appear to be under the influence of the follicular hormone. The first question that arises is this: does the capillary bed of the whole body show similar rhythmic changes? He did not think that an answer could be given at the present time. To be sure nothing similar has been reported by Krogh and his followers in their studies of the capillaries, but none of them have studied so rich a capillary bed in mammals as the uterine mucosa affords. Other tissues which Mr. Markee has transplanted do not show the blushing and blanchings nor were they reported in the recent detailed study of the living human uterine mucosa by Schroeder.

If these vascular changes are specific for the uterus, we are confronted with an interesting question regarding the blood vessels of the transplant. Has a new set of vessels grown in from the iris which is specifically influenced by the tissue

it supplies? The alternative is that the original blood vessels of the transplant anastomosed with the iridial vessels and consequently persisted. Dr. Van Dyke has emphasized the other important feature of these "Schochet transplants," namely, their value for studying the effects of various drugs upon the capillary circulation.

DR. SYDNEY S. SCHOCHET felt that all the credit for this work justly belonged to Mr. Markee. If it can be conclusively proved that this rhythmic contraction is specific to the capillaries of the endometrium; it offers an explanation to the mechanism in which bleeding is controlled during menstruation. This problem offers a wide field for further investigation, as the anterior chamber of the eye is an ideal culture medium for tissue growth.

DR. JOSEPH L. BAER AND DR. RALPH A. REIS (by invitation) presented a paper entitled, **The Interposition Operation for Prolapse of the Uterus. An Analysis of 91 Consecutive Cases with Immediate and Remote Results.** (For original paper see page 233.)

ABSTRACT OF DISCUSSION

DR. W. C. DANFORTH said that his own feeling regarding the interposition operation is not as clear as that of Dr. Baer and his coworkers. Dr. Baer very clearly sets forth that the operation is not one to be applied to all cases of prolapse, and he brings out in his follow-up that his failures have all been in cases in which a marked degree of prolapse existed and in which the cervix and the uterus protruded. Based on the experience he had had with this operation covering a fair number of cases, it seemed to him that it was applicable to cases of prolapse which are associated with a marked degree of cystocele and in which the prolapse seemed moderate, that is, a prolapse in which a cervix of normal length did not protrude beyond the vulva or if it did, protruded very little. It seemed to Dr. Danforth that if the protrusion of the cervix of normal length extends beyond the vulva, the operation has not given as good results as some other methods. The essayist appears to have used it in 42 cases in which prolapse of the third degree existed with a remarkably small incidence of recurrence. He wondered, in listening to the paper, whether or not some of these did not have a rather elongated cervix so that the actual prolapse did not appear to be represented by a marked protrusion.

Dr. Baer stressed the importance of a thorough repair of the posterior vaginal wall. Dr. Danforth insisted that one should not do any interposition or any operation for prolapse without being sure there is a thorough repair of the relaxed posterior vaginal wall in cases in which relaxation existed, which he always does in operations of this sort.

The mortality rate of 1.1 per cent is very good. The mortality from shock, hemorrhage, etc., should be low. One of these patients reported died of embolism and Dr. Baer spoke of it as cerebral. He wondered if it were not a pulmonary embolism.

The catheterization record is very good. It seemed that 52 per cent required none. That speaks very well for nontrauma work.

Ninety-two per cent of success with any operation for prolapse, vaginal or otherwise, is excellent. The operation can be considered as one that has a very great place in slight prolapses which are not marked and where the cervix is coming down, previously associated with very marked cystocele, and lastly in women

in whom further childbearing is not desirable. His own experience with this operation is practically limited to women who are past the childbearing period. Of late he has used this method a little less often than previously. He has been a little more inclined to do an advancement of the base of the broad ligament to the bladder in some of the cases in which he formerly did a reposition.

DR. CAREY CULBERTSON said he felt like joining Dr. Danforth in the limitations that he has imposed upon himself for indications for this operation. The procedure was devised by Watkins as a cystocele operation and not as an operation for procidentia uteri. He felt that the limitations placed upon it by Watkins have not been followed by gynecologists and surgeons in general who have used it as a method of cure for procidentia. In his own work he has done this operation a considerable number of times, not as many as 91 per cent, but he has not done the operation in any case where the uterus came out or where the cervix came out unless the prolapse of the cervix was due to elongation. Where amputation of the cervix still left enough of the uterus to act as a support for the bladder, he had performed this operation in 2 or 3 cases and had taken care to fix the cervix in the posterior vaginal wall in association with transposition.

Another thing that he has carefully avoided in this operation is to use a uterus that is bleeding excessively for that purpose. That type of uterus should come out. There are only a few such cases. Dr. Baer speaks of metrorrhagia in 1 per cent and menorrhagia in 3 per cent.

As far as the size of the uterus goes, the majority of these patients are senile and the uterus is small. He had not found many cases where the uterus was too small for practical use beneath the bladder. In some cases he has not used it because he thought it was too large. In some cases where the uterus was large enough, he did the operation which Dr. Baer described and in association a fundal amputation. The point which Dr. Danforth emphasized regarding the fixation of the fundus to the pubes, he had not done, probably for the reason that he has not been struck with the importance of it, though it has been emphasized by Danforth, and by Baer. The results have been so good that he has been satisfied to follow in the way Watkins led.

He was rather surprised at the small number of cases in which there was urinary incontinence in this series. He expected more patients to show it.

The operation is usually referred to, as Dr. Baer referred to it, as the interposition operation. That was the name used by Watkins originally, but later he preferred the word transposition instead of interposition. He merely brought up this point of historical importance. As of further historical interest, the transposition of the uterus from the pelvis into the vagina was first done by Frank by bringing it out through the posterior culdesac for the purpose of closing fistulous tracts, rectovaginal, and vesicovaginal. Shortly after, Frank and Dürhssen separated the bladder from the cervix and brought the uterus forward. That was done for what was called in those days, vesical fixation of the uterus and was performed for retroversion of the uterus. This was an operation much like the operation that is now known as advancement of the bladder. Wertheim probably preceded Watkins in bringing the uterus into the vagina under the bladder, but he did not cover it with the vagina. He left it exposed. Watkins was the man who first placed the uterus under the bladder for the purpose of curing a cystocele and closed the vaginal wall over it. For that reason this should be called the Watkins operation, and he felt that the members of the Chicago Gynecological Society particularly should emphasize this point.

DR. N. S. HEANEY said that he has become more stringent in his indications for doing the interposition operation. Where there is an enormous cystocele, there is nothing as efficacious as the transposition operation, providing the uterus is not too low. He has limited this work almost exactly as Dr. Danforth has. Where the cervix protrudes from the vulva and this cannot be corrected by an amputation of the cervix, some other operation should be done.

DR. C. W. BARRETT said that he had given considerable thought and attention to the question of pelvic floor anatomy, especially to the condition and correction of redisplacement and prolapse. This tended to bring him more or less difficult cases. He tried to give to each patient the most normal condition that could be arrived at. One should try to think of the condition that these patients have before childbearing takes place, if they are constructed normally and not subnormally, because some patients have hernias here as well as in the inguinal region. It has been said that this operation is only applicable to patients where the uterus does not come outside. That is not a difficult condition to correct. It is the one where the uterus comes outside the vagina, between the patient's legs, that causes trouble.

DR. W. McI. THOMPSON said he wished to rise in defense of the Wertheim-Schauta operation. In 1902 as a student in Wertheim's clinic, he assisted in this operation and also performed the operation under the instruction of Wertheim's first assistant. It is very similar to the Watkins method. He stripped back the mucosa from the superior wall of the vagina. In drawing down the uterus volsella were used to climb hand over hand up the anterior wall of the uterus, until the peritoneal cavity was opened, when the position of the uterus was reversed. The posterior wall of the uterus was implanted under the bladder and the cornua sutured to the lateral ligaments, the serosa being first stitched to the back of the uterus.

One idea which Wertheim and later Howard Kelly suggested was the reduction of the body of the uterus when too large to implant under the bladder. This was done by splitting the uterus down the center and taking out a wedge to reduce it to the proper size, or the enucleation of fibroids for the same reason.

Another suggestion in handling cases where the transposition operation has been performed with amputation of the cervix is to cut a hole through the fundus and leave a drain in situ until a fistula forms, so that the menstrual discharge can flow through this artificial opening in place of through the cervix.

DR. CAREY CULBERTSON, in answer to Dr. Danforth, about fixing the cervix posteriorly, said that this was one of the problems which Dr. Watkins also attempted to solve so that he could use this operation in case the cervix was prolapsed. He attempted to solve it when he had the vaginal wall laid open by bringing forward the uterosacral ligaments. Jellett also has described a method of shortening the uterosacral ligaments for the same purpose of holding the cervix back toward the sacrum. Dr. Culbertson said he did not know how to keep the cervix back until he had a patient with a cystocele in whom the cervix did not come out. He thought it would be a proper case for a Watkins transposition operation. When he sat down to perform the operation, he discovered that as a result of some preexisting, probably inflammatory condition in the posterior vaginal wall, the cervix was fixed there deep in the posterior vault very nicely. He did not disturb that fixation. The patient did so well and the result was so satisfactory that he subsequently made this fixation in two other cases artificially. In procidentia it is the upper portion of the vagina that comes down rather than the lower and it is only in third degree procidentia where the entire vagina comes out, where it becomes detached from the white line. He is satisfied, however, that such fixation of the cervix to the posterior vaginal wall would not be advisable in every case.

DR. L. E. FRANKENTHAL asked Dr. Culbertson if he was familiar with the Kielland operation. Kielland splits both the anterior and posterior cervix, undermines them and makes a small strip down the posterior wall of the vagina and buries the cervix.

DR. CAREY CULBERTSON said that the thing that is done at these operations to hold the cervix up is a perineorrhaphy, as Dr. Barrett emphasized. The whole vagina should be narrowed, as Dr. Baer explained, instead of making another hole in the pelvic floor.

DR. BAER, in closing, said he held no brief for the transposition operation. His object in presenting this statistical analysis was to analyze the results obtained with a particular kind of operation in an institution where a group of men are doing similar technical procedures. In a subsequent paper which will be read shortly, eleven types of operation proposed for the cure of prolapse will be analyzed and that paper likewise will not be a defense of the eleven types but again a presentation of the results of each of them and a comparison of their relative merits.

As to the limitations in the choice of patients, that must be an individual matter. The gynecologist who acquires a certain deftness with a given procedure is certain to get better results with that procedure than a man who uses that identical procedure only occasionally; the more often he carries out that particular technic the more likely he is to continue to get better and better results, so that use and repeated use has its value even with an operation that may have lesser mechanistic merit.

The size of the corpus does play a part in utilizing it anteriorly under the bladder. The women who come in with prolapse come either at or before the menopause, that is, in the fourth or fifth decade, or they do not come for another twenty years until their pelvic tissues are rather atonic, that is, in the sixth or seventh decade; nevertheless, it is not so that most of these elderly women have atrophic, senile uteri. The larger number have a fairly sizable uterus which can be utilized in the anterior vaginal wall. The objection to implanting a smaller uterus is that there may be a recurrence of the cystocele.

Constipation can be due to diastasis of the levator ani. It can be due to distention of the rectal ampulla. That constipation of this type can be cured much better by a pelvic floor reconstruction than by administration of medicine is likewise true.

Dr. Barrett holds to anatomic reconstruction and that is an excellent position to take, one at which we all aim, and yet the ultimate object of the physician is to relieve the patient permanently of the symptoms present.

The surgeon who collapses a chest wall because of an intractable empyema or a tuberculosis, is not restoring the parts to their normal anatomic condition, yet there seems to be a unanimity of opinion that collapse of the chest wall has produced cures in cases that were theretofore intractable. So, too, with hernias of the uterus and bladder. The symptoms may be relieved permanently even though the anatomic relations may be disturbed.

DR. GEORGE FIELDING HIBBERT (by invitation) presented a paper entitled, **Protein Therapy in Gynecology**. (For original paper see page 227.)

ABSTRACT OF DISCUSSION

PROFESSOR W. F. PETERSEN said that unfortunately his experience has been limited to other conditions. There is no doubt from the literature that the closed gonorrheal infections in men are influenced by therapy of this type. He

presumed that one should have a larger series of cases of the same type to determine ultimately the real value of the treatment. The difficulty is that physicians think all patients react alike. All patients do not react alike. In an injection of this sort one has a wide variation, just as one has a wide variation from adrenalin injections. One must keep in mind that the reactivity of the person is decidedly influenced by the infection from which he is suffering. Then one must keep in mind that the material injected plays a very large part, so that one can have all varieties of effects from psychic effects down to the most severe shock reactions. Even the very mild effects from intracutaneous injections sometimes give a therapeutic result.

The essayist pointed out that the primary result is one of stimulation. That is probably correct. It should, perhaps, be emphasized that the primary reaction is a capillary reaction; the capillaries react more definitely and more violently to some stimulants. Following the primary reaction there is a reversal—a biologic rest phase sets in with an effect on the individual as a whole. In the period when the temperature recedes, inflammatory reactions are lessened, depending on the dosage. He pointed out that in puerperal infection with a marked inflammatory reaction, with high fever, larger doses are sometimes used with success. These are the type of cases which Kraus first tried when he treated puerperal infection by intravenous injection. On the other hand, the chronic infections such as were described tonight very frequently do better with small doses.

He emphasized one thing, namely, that human beings are relatively resistant to anaphylactic shock; secondly, that milk seldom gives rise to anaphylaxis. In the hundreds and thousands of cases that are reported in the European literature, one can find only 3 or 4 cases of shock. If treatment of this sort is instituted, it should be done with good judgment, and the type of reaction should be carefully ascertained by clinical observation.

DR. A. G. GABRIELIANZ said that Aolan treatment is quite free from anaphylactic shock. In nearly ten thousand injections there was no case of shock. There were 82 per cent good results, which is a high percentage when compared to the results obtained from operations which are done very widely in most of the big clinics. It is interesting to compare the operation in America and in Europe. In Europe the operations in chronic pelvic infections were attended with a high percentage of deaths. In America the percentage is very low, 1 or 0.5 per cent, because of difference in virulency of germs. After operation most of the patients complain of pain, nearly the same pain as they had before. Some authors state that 50 per cent of the operations do not relieve the pain. To compare with protein therapy 82 per cent and 50 per cent is very good. Every patient should first be given protein therapy and if that does not help, operation can be resorted to.

The dosage is different. Many authors use 10 c.c. of Aolan. Experience shows that 7 c.c. twice a week gives much better results than 10 c.c.

After operation most of these patients have subjective symptoms. Bimanually it is found that a good many operative patients in from five to six weeks after operation will have an area of infiltration which is very painful on examination. Those patients when treated by protein therapy usually have successful results. Small areas of pelvic infection and infiltration of the sacroiliac ligaments do not respond so well to protein therapy but respond very well to diathermy. Many physiotherapists do not know much about gynecology, and it is well that the gynecologist states what kind of treatment he wishes. If the patient has sacroiliac infiltration, very good results can be obtained from diathermy.

It is necessary to mention the action of the reticulo-endothelial system in nonspecific protein therapy. The cells of the reticulo-endothelial system have

phagocytic power and take care of germs, as well as their toxin. The cells can be found in peripheral blood in the form of monolymphocytes. Especially rich in these cells are liver, spleen, lungs, bone marrow, and subcutaneous tissue. As Saxl states, the subcutaneous tissue contains reticulo-endothelial cells in form of histocytes, having migrating power and partly converting into monocytes in circulating blood.

DR. C. W. BARRETT said that in the large number of cases of infection encountered at the Cook County Hospital, marked changes take place in patients with pelvic masses in a much shorter period of time than those without this type of treatment. He thought a little care should be taken in drawing conclusions from what was shown in one year and compared with what might be expected without this treatment. At the County Hospital patients come in with a temperature of from 101° to 103° F., and there is no difficulty in bringing the temperature down to normal in a week or ten days; and in many cases where the inflammatory mass has its origin outside the tube the patient does so well that she is perhaps able to bear a child again in the course of a year. It is a question whether this treatment would be the best for pus tubes. Of course the mortality can be made very slight. As to pain in these cases, the pain is mostly present during the activity of the process. When the activity ceases, they are so free from pain that they often want to go home, even though large masses are present.

DR. HIBBERT, in closing, said in regard to the point brought out by Dr. Peterson that there was an individual reaction in connection with the protein therapy; it was found that there were persons who did not respond and therefore protein therapy cannot be used as a routine treatment of these cases. That is perhaps one of the reasons why the general practitioner and many more in gynecology who have used protein therapy have not obtained the results that they should. It is not a routine treatment. As brought out in the paper, there are often pathologic conditions associated with true inflammatory cases that may change the entire picture so that operation may be indicated almost at once, that is, if the inflammatory condition is of the subacute type and it would not endanger the patient's life to open the abdomen. Where there is a simple or relatively simple mass in the pelvis, those patients do respond to treatment in a varying degree. This brings out the point that it is an individual treatment and cannot be generalized.

In connection with the treatment he uses alkaline douches, the knee-chest position, and a bland diet. All these cases have been on general routine management, including vaginal tamponades and other methods and have not responded to treatment. That is why they were put on the Aolan treatment.

Dr. Hibbert agreed with Dr. Barrett that rest in bed with an ice-bag will bring down these masses in the abdomen, and the patient will be able to leave the hospital or get out of bed at home. The point is, how many dispensary patients will do that? They may be told to stay in bed, but they go home where they have five or six children and they cannot stay in bed. The family conditions do not warrant rest in bed.

In answer to Dr. Culbertson's question as to the kind of milk he used, he said that when the patients came into the dispensary they were asked to purchase an ampule of Aolan. He used that form of protein therapy because of its accessibility and its relatively low cost to the poor patient. He did not use boiled milk.

In answer to Dr. Schochet he said he did not do the sedimentation test.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

COLLECTIVE REVIEW

THE SECOND INTERNATIONAL CONGRESS OF RADIOLOGY AT STOCKHOLM, JULY, 1928

A RÉSUMÉ OF IMPORTANT PAPERS RELATING TO GYNECOLOGY

BY ARTHUR STEIN, M.D., F.A.C.S., NEW YORK

(Associate Gynecologist, Lenox Hill Hospital)

IN JULY, 1928, there was held in Stockholm the Second International Congress of Radiology, which was, as might be said right at the start, a perfectly conducted meeting.

Weeks in advance of the meeting a program containing abstracts of all the papers to be read were in the hands of the members of the congress, and at the beginning of the same a book containing the photographs as well as a short description of the medical curriculum of each member was distributed.

The meetings were held simultaneously in five different rooms in the beautiful new parliament building opposite the royal palace. It was possible to know exactly what was going on in each room through a bulletin board in every room which was changed constantly so that one could easily orient oneself as to the speakers and papers being presented in the other rooms at any given time.

All of the meetings started at 8:30 A.M. and lasted until 10:30, and again started at 2:30 and lasted until 4:30 P.M. Each speaker had ten minutes at his disposal in which to read his paper. Here was a splendid example of how a congress really should be conducted and it might well be imitated by all other congresses.

A demonstration was given showing how much could be done in a short time when the "Radiumhemmet" was given over one morning to report its achievements. At this time Forssell and nine of his able assistants gave their results during the last fifteen years in the short space of two hours. This report was a revelation in brevity and exactness.

At a special meeting there was a discussion as to the training in medical radiology, and it was shown that Sweden leads all other countries in this subject, having already three chairs for this specialty.

On the last day of the congress there was a demonstration of different types of treatment at the "Radiumhemmet," which unfortunately I could not attend. I know, however, that the external radium treatment with very strong radium preparations has been found to be of increasing value.

Admiration for the splendid arrangements and for the way in which the congress was conducted was adequately expressed by the dele-

gates from the European as well as the North and South American countries at the end of the morning session at which the gentlemen from the "Radiumhemmet" (radium institute) gave their reports.

In closing these general remarks I would like to mention the splendid reception the members of the congress were given by the city of Stockholm, consisting of a really unusual dinner and dance arranged by the city at the beautiful new city hall.

All in all the congress was a memorable event, due mainly to the great efforts of Professor Forssell and his also justly famed assistant, Dr. James Heyman.

RADIUM TREATMENT AT "RADIUMHEMMET"

Of particular interest was the report by Dr. James Heyman on the technic and end-results of radium treatment for cancer of uterus and ovaries at "Radiumhemmet," in Stockholm. Unfortunately, the darkness required for lantern demonstrations made it impossible to take notes and this article has not yet been published; but from my recollection and Heyman's previous articles, the technic and results may be described.

In Stockholm a complete follow-up study can be made of all cases. Heyman's report is based on end-results in 100 per cent of the cases treated. The "Radium Home" is controlled by the Swedish Government, and all patients are required by law to report when requested. In the case of poor patients living outside of Stockholm, the Government pays the traveling expenses. For this reason, Heyman's follow-up study is much more complete than would be possible in the United States.

Heyman's technic includes three treatments with radium salt, the second one week after the first and the third three weeks after the second. The radium is introduced into the uterine cavity and packed against the tumor surface in the vagina. Twenty-two hours of exposure and the same amount of radium are used in each treatment. The total dosage for the three treatments is about 2,400 mg. element hours in the uterus and 4,500 mg. element hours in the vagina. A heavy filtration, equivalent to 2 mm. of lead in the uterus and three to four in the vagina, is employed.

In the "Radium Home" the combined use of roentgen rays and radium has been abandoned, because the results proved better when radium was used alone.

When the glands, bladder, or rectal wall are involved or the tumor is fixed by involvement of the parametrium, Heyman considers the case inoperable. Movable tumors without involvement of the bladder, rectum, or glands are considered operable.

About 1920, Heyman states, the leading gynecologists of Sweden gave up operating for carcinoma of the cervix. As a result, more operable cases were submitted for radium treatment; but, even as late as 1921, the inoperable and borderline cases constituted 63.5 per cent of the total.

In a series of five hundred cases of cancer of the cervix treated with radium from 1914 to 1921, 112, or 22.4 per cent, were free from symptoms five years after treatment was begun. Clinical healing resulted and persisted for at least five years in 47.6 per cent of the 145 operable

and borderline cases. In a series of forty-six cases of cancer of the body of the uterus treated from 1913 to 1921, twenty patients, or 43.5 per cent, were free from symptoms after five years. The average figure for surgical cure in such cases is 42.8 per cent. In operable cases of cancer of the uterine body there were 60 per cent of five-year cures at the Radium Home; in this type of case, surgery yields 58.8 per cent of five-year cures.

OTHER REPORTS ON RADIOTHERAPY FOR CANCER OF THE UTERUS

B. Archanguelsky, of Moscow, presented a statistical review of the results of radiotherapy and surgery in 5,092 cases of cancer of the female genitals treated with radiotherapy and 482 cases treated surgically. These cases were collected from the literature. As a criterion of "cure" he adopted the rule of Winter and Regaud; i.e., complete absence of all symptoms of cancer five years after treatment. On this basis, he found that 37.7 per cent of operable cases of cancer of the female genitals treated surgically and 41.5 per cent of those treated by radiotherapy had five-year cures. In operable cases of cancer of the cervix, 35.3 per cent of those treated surgically and 41 per cent of those treated by radiotherapy had five-year cures. In operable cases of cancer of the corpus uteri, surgery gave 46.4 per cent of cures and radiotherapy 48.4 per cent. In borderline cases of cancer of the genital tract, as a whole, surgery showed 5.2 per cent of cures; radiotherapy, 23.8 per cent. In cervical cancer belonging to this group, surgery gave 5.4 per cent of cures; radiotherapy, 25.6 per cent. In cancer of the corpus uteri belonging to this group, there were no cures in cases treated surgically; 23.8 per cent, in those treated by radiotherapy. In the borderline cases, therefore, the value of radiotherapy is especially evident. In cases of the third and fourth groups, the inoperable and "hopeless" cases, surgery failed entirely in all cases of cancer. In inoperable cases radiotherapy gave 9.1 per cent of cures in cancer of the genital tract as a whole; 9.8 per cent, in cancer of the cervix; and 6.1 per cent, in cancer of the corpus uteri. In the fourth group, "hopeless" cases, 1.5 per cent of all cancers of the genital tract were cured, and 0.3 per cent of those of the cervix uteri. Radiotherapy, therefore, evidently gives better results than any other method of treatment in inoperable cases.

G. Gambarow, of Tiflis, North Georgia, Asia, reported on the treatment of more than five hundred cases of inoperable cancer of the cervix uteri with radium from 1914 to 1923, partly at Moscow and partly at Tiflis. For the first part of this period (at Moscow 1914-1919), no definite statistics were available; but the results were favorable in that marked improvement or complete relief from symptoms was often observed, and a few cured cases (no recurrence after five years) were recorded. In the second period (at Tiflis 1920 to 1923), 104 cases were treated, with five-year cures in six cases, or 5.7 per cent. In this series, as a whole, immediate improvement followed treatment; i.e., cessation of bleeding, relief of pain (often complete), cessation of the foul discharge, and improvement in the general condition. Gambarow's technic is as follows: Radium tubes of 50 mg. are placed in the uterus for twelve to fourteen hours. This treatment is repeated five to seven times at one to two-day intervals, with a total dosage of 3,000 to 4,900 mg. hours. Gambarow concludes that radium

treatment is the only method that gives relief in inoperable cancer of the uterine cervix and that in a small percentage of these cases it results in cure.

P. Strassmann, of Berlin, reported that he had treated about 1,100 cases of cancer of the uterine cervix with radium or mesothorium since 1913. The first application of radium was made to the portio vaginalis, or at most in the cervical canal. This method reduces the chance of infection, and later applications can be made higher. One application is made within the corpus uteri. Each application is made for not more than twelve hours. It is repeated every third day until a total dosage of 2,000 to 3,000 radium element hours has been given. After an interval of four weeks, the glands are treated by deep roentgen-ray irradiation. Another series of treatments is given only if the first series was too short or if there is recurrence of bleeding. The primary mortality from such radium treatment is nil, and it results in greater prolongation of life than operation in carcinoma of the cervix. In carcinoma of the corpus uteri, intrauterine application of radium is used in women over sixty years of age; others are operated upon by the vaginal route.

W. Lahm, of Chemnitz, Germany, reported the results of treatment of carcinoma of the cervix uteri with radium or combined radium and roentgen-ray irradiation at the Woman's Clinic of Dresden. From 1915 to 1923, 469 cases were treated with 109 five-year cures, or 23.5 per cent. From 1915 to 1923 treatment with radium was used predominantly. It was found that the results depended upon the dosage. In Group 1 (early cases), 50 to 60 per cent of cures were obtained with 3,000 to 6,000 mg. hours; in more advanced cases (Groups 2 and 3), the optimum results were obtained with a dosage of 8,000 to 10,000 mg. hours. The optimum dosage must be given within three to five weeks; the maximum dosage did not exceed 13,000 mg. hours. With combined radium and roentgen-ray irradiation, which was used chiefly from 1921 to 1923, the dosage also must be carefully regulated to obtain the best results. The combined method improved the results in the more advanced cases (Groups 2 and 3); in the early cases, careful radium treatment gave the most satisfactory results. The maximum dosage with the combined treatment was 5,000 to 7,000 mg. hours of radium applied in the cervix and 600 to 1,000 R units of roentgen rays over the pelvis.

The prognostic value of histopathologic groupings in cases of carcinoma of the cervix, on the basis of five-year end-results, was studied by H. Schmitz, of Chicago. The cellular types, the degree of regularity or irregularity of the cells and their nuclei, the functional activity, chromatinosis, distinction or indistinction of the cellular wall, and mitoses were examined and rated from 1 to 4. The sum of these results was termed "the malignancy index." A plan of grouping according to clinical findings was also formulated. From a study of Schmitz's results, the histopathologic and clinical groupings would appear to be of definite prognostic value and also to furnish a guide as to the particular type of treatment to be selected.

RADIATION THERAPY FOR UTERINE MYOMAS

E. Zweifel, of Munich, noted that the treatment of uterine myomas by irradiation is on a much more secure basis than that of uterine carcinoma: The results of the treatment in myoma are known within

a few months, while in the case of carcinoma several years' observation is necessary to determine results correctly. Zweifel reported that at the Woman's Clinic of the University of Munich 846 cases of uterine myoma were treated by roentgen rays from 1913 to 1926. Results with the earlier series have already been reported. From 1920 to 1926, 408 cases were treated, of which 236 were traced. In 228 of these 236 cases complete amenorrhea resulted from the treatment; in seven cases menstruation began later, but the patients were free from all symptoms; in thirteen, or 6 per cent, of these cases treatment failed to relieve symptoms; in six of these cases the diagnosis proved to be incorrect (ovarian tumor); in one case a polyp of the uterine mucosa explained the persistence of bleeding; in three cases carcinoma was later found to be present; in two cases there was degeneration of the myoma; in only one case could no reason for the persistence of symptoms be found.

A. Bécclère, of Paris, stated that myomas of the uterus are distinguished from all other neoplasms by their close relationship with the ovaries and the most manifest sign of ovarian function, menstruation. Roentgen irradiation, outside of its effect on ovarian function, has no direct action on the myoma. This is shown by clinical observation and the effects of treatment when, as occasionally occurs, the myoma begins to grow after the natural menopause. The menopause obtained by roentgen-ray treatment does not differ in its symptoms from the natural menopause. There is a wide variation in the intensity and duration of symptoms in different women. The characteristic symptoms of the menopause do not depend upon the cessation of the monthly flow of blood, considered as a means of excreting toxic substances; for in cases in which the cessation of menstruation is temporary these symptoms disappear at least two weeks before the recurrence of the menstrual flow. This disappearance of symptoms is often sudden and is the first sign of returning ovarian function. It is usually accompanied by a recrudescence of growth in the myoma. Further treatment results in regression of the myoma and recurrence of the symptoms of the menopause, indicating suppression of ovarian function. When the ovaries have ceased to function, after roentgen-ray treatment of myomas, they may become cystic and necessitate operation.

RADIOTHERAPY FOR CLIMACTERIC HEMORRHAGES

H. Runge, of Kiel, Schleswig-Holstein, discussing the treatment of hemorrhages at the climacteric, points out that roentgen-ray castration is not a suitable method of treatment for all types of excessive bleeding. Such treatment is indicated only in those cases in which the bleeding is too severe or too frequent but there is a regular menstrual flow without bleeding in the interval. In such cases roentgen-ray treatment is indicated, whether bleeding is due to uterine myoma or not. The periodicity of the bleeding in any case indicates that it is due to shedding of the endometrium during the menstrual period. When the bleeding is irregular or constant, it indicates that the cause is not due to disturbances of menstruation resulting from changes in the ovarian cycle. In such cases examination of the uterus and curettement are necessary to determine the cause such as incomplete abortion, carcinoma, polyp, submucous myoma, etc., none of which is influenced by roentgen-ray treatment. The frequent pathologic change

in the climacteric described by Schröder as metropathia hemorrhagica, which is due to cystic hyperplasia of the mucous membrane, is also not amenable to roentgen-ray treatment until after the uterus has been curetted. Then the reaction of irradiation is satisfactory. In 204 cases of this type so treated, there was a recurrence in only two cases. With proper selection of cases good results from roentgen-ray therapy are to be expected in practically 100 per cent of cases of hemorrhage in the climacteric. Without such selection, many failures are inevitable.

UTEROSALPINGOGRAPHY

C. Heuser, of Buenos Aires, discussed radiography of the uterine cavity with lipiodol and claimed priority in this method, stating that his first report appeared in 1921 and that Wintz, of Germany, and Bécélère, of France, did not report their work until 1925. The procedure is useful in the diagnosis of deformities of the uterine cavity by abnormal growths, such as placental rests and tumors; in the diagnosis of pregnancy; in distinguishing between fibroma and pregnancy; in various pathologic conditions in the uterine cavity, variations in position, etc.; in determining the form, position and size of the lumen of the fallopian tubes; in the diagnosis of diverticula of the tubes; in determining the condition of the tubouterine sphincter and various modifications that may cause pelvic infections; in the diagnosis of tumors of the tube; in determining causes of sterility of uterine or tubal origin; in the diagnosis of uterine deformities, bicornate uterus, infantile uterus, etc.; and in determining the conditions of muscular contractility of the uterus and tubes. The procedure is without ill effects if proper precautions are observed.

Bécélère reported that he had used lipiodol for the roentgen-ray examination of the uterus and tubes in more than 150 cases without the slightest ill effect, even in 40 cases of salpingitis. To obtain satisfactory results, it is necessary to block the cervix well, to inject the lipiodol under pressure, and to control the pressure by means of a manometer. The radiologic examination should include fluoroscopy, radiograms from the front and sides, and control examination the following day. Indications for the use of this method include the following: Study of the permeability of the tubes in cases of sterility and salpingitis and for the differential diagnosis between appendicitis and salpingitis; differential diagnosis between fibroma and cyst; and study of metrorrhagias for early diagnosis of cancer of the uterus. The only contraindications are pregnancy, fever, and severe hemorrhage.

J. Iribarne and N. Capizzano, of Buenos Aires, stated that they use salpingography with lipiodol in all cases of sterility. In some of these cases the injection of lipiodol was sufficient to remove the obstruction from the tubes and conception occurred shortly after the examination. In others a second injection of lipiodol was necessary after treatment with diathermy or high frequency currents for the pathologic condition in the tubes.

By means of hysterosalpingography following the injection of iodized oil, S. N. Bakke, of Bergen, Norway, observed that the direction of peristalsis in the fallopian tubes is away from the uterus and toward the ostium abdominale. When iodized oil was injected into the ampulla of the tube during operations for chronic appendicitis, it was ejected into the peritoneum in exactly the same manner as when intro-

duced into the uterus. According to Bakke's observation, the uterus after the injection of iodized oil empties itself partly through the fallopian tubes into the peritoneal cavity and partly through the cervix into the vagina. These findings are contrary to those of Kok and Mikulicz-Radechi in 1926, who reported that in surviving fallopian tubes the direction of peristalsis is from the ostium abdominale to the uterus.

G. K. F. Schultze, of Berlin, illustrated his findings in hysterosalpingography, showing that with an opaque medium the motility of the female genitals can be demonstrated in four typical phases. Physiologic and pathologic variations occur, owing to differences in technic and functional and anatomic conditions. The roentgen-ray technic must be such as to show all these anomalies and the difference between physiologic and pathologic abnormalities under optimum conditions.

PYELOSCOPY

A. Leb, of Graz, Austria, reported that since 1923 he had used pyeloscopy as an aid to the diagnosis of renal and ureteral disease. In the course of the fluoroscopic examination with an opaque medium, manual pressure on the abdomen is employed. Pyeloscopy by this method has shown that purely functional disturbances of urinary excretion with anatomically healthy kidneys are usually due to neurologic conditions of extrarenal origin. When the pyelographic findings are of uncertain significance, pyeloscopy may establish the diagnosis by showing a constant change on examination in various diameters. Pyeloscopy has proved itself to be of value in diagnosis, as shown by verification of the findings at operation in many cases in the following conditions: demonstration of functional disturbances in anatomically healthy kidneys, such as paresis of the musculature of the renal pelvis by injury to the lumbar and sacral vertebrae; spastic changes in spina bifida occulta, etc.; diagnosis of conditions leading to the establishment of hydronephrosis; hyperkinetic emptying of the kidneys; diagnosis of malignant tumors of the kidney by clearly demonstrating filling defects that are constant; differentiation between inflammatory conditions and renal tumors by demonstrating differences in the method of emptying the kidneys. Pyeloscopy is not a substitute for pyelography but an adjunct to it.

A. Lemberg, of Charkow, reported that he had found pyeloscopy of definite value as showing the functional variations in the urinary tract and aiding in the interpretation of the static conditions shown by serial radiogram. The findings indicate that lipiodol and iodopin, used as opaque media, do not injure the mucous membrane of the urinary tract. The fluoroscopic examination must be made with the patient in the vertical as well as the horizontal position. Pyeloscopy demonstrates the rhythmic contractions of the renal pelvis and the peristalsis of the ureter, also any peristaltic changes or abnormalities in the method of emptying of the renal pelvis. Under normal conditions, the emptying time of the renal pelvis and the ureter is six to twenty-four minutes, according to the position of the patient, the muscular tonus, and the character of the diuresis. Pyeloscopy is of special value in demonstrating motor insufficiency of the urinary tract of either primary or secondary origin.

G. Andrén, of Umea, Sweden, described an improved technic for the pyelographic diagnosis of renal tuberculosis, whereby sharp definition

and richness of contrast in the pyelogram may be obtained to an unusual degree. In early renal tuberculosis he believes the characteristic feature of the pyelographic picture to be the presence of signs of infiltration of a calix wall and narrow fistulous tracts extending from this area.

PNEUMOPYELOGRAPHY

K. Neuwirt and J. Simon, of Brünn, Czechoslovakia, reported that up to March, 1928, they had used pneumopyelography in 320 cases without any untoward effects. They insufflate the renal pelvis with air slowly and carefully. They have found pneumopyelography of special value in the diagnosis of stones in the renal pelvis, as it demonstrates stones not visible in the usual radiogram and shows their number, form and position more exactly. It is also of great value in the diagnosis of tumors of the renal pelvis, especially small papillomas, and of ureteral stones. In complicated cases pneumopyelography is combined with pyelography with an opaque medium.

CANCER OF THE BREAST

F. Nahmmacher, of Dresden, recommended the following treatment for cancer of the breast: intensive x-ray irradiation of the entire breast, the axilla and the supraclavicular and infraclavicular region prior to operation; radical operation, including removal of the skin followed by Thiersch grafts. Nahmmacher believes that most recurrences in breast cancer originate in the skin stretched over the operative wound, and that, therefore, the skin must be sacrificed. Four weeks after operation, irradiation of the axilla and the supraclavicular and infraclavicular region with radium should be employed. In advanced cases with attachment of the tumor to the musculature and costal arch, the entire side of the thorax should be treated with radium in small fields. If radium is not available, the roentgen rays should be used postoperatively, but Nahmmacher is convinced that radium is preferable. This method is contraindicated in cases with cachexia and metastases.

F. Benard-Guedes, of Lisbon, reported that at the Portuguese Cancer Institute, in Lisbon, roentgen-ray treatment was used for the treatment of cancers of the breast which were anatomically operable but in which there was some other contraindication to operation. The method used was that of irradiating the breast tangentially, by cross-fixing, and irradiating the axillary and supraclavicular regions separately. Only thirty-three cases have been treated by this method, the first case in 1925 and the last in November, 1927, so that no conclusions as to end-results can be drawn. Of those treated, four have died from visceral metastases; the others show no signs of recurrence. Four have been apparently cured for three years. It has been found possible to obtain complete disappearance of the breast tumor by roentgen irradiation alone; also disappearance of glandular masses, if they are not too large.

ADNEXAL TUBERCULOSIS

P. Gilbert, of Paris, advocated radiotherapy for the treatment of tuberculosis of the uterine adnexa. Surgical treatment in these cases is difficult and is indicated only when the lesion is unilateral. Radiotherapy does not involve any immediate risk and does not cause the

formation of fistulas. It is suitable for extensive lesions. In the treatment of such cases, Gilbert believes that ovarian function should be completely suppressed. He uses penetrating or moderately penetrating roentgen rays, well filtered (0.5 mm. copper and 1 mm. aluminum); fractional doses, 500 R units per field once or twice a week; two fields below the umbilicus and, if there is evidence of peritoneal involvement, two others above the umbilicus; total dose, 3,500 to 5,000 R units per field. A second series of treatments should be given in two months if the result is not satisfactory. General light treatments should be used to build up the general condition.

TUMORS OF THE BLADDER

H. Young and C. A. Waters, of Baltimore, stated that suprapubic surgery is a failure for tumors of the bladder. They described an endovesical technic for the application of radium directly to bladder tumors. They use four types of cystoscopic radium applicators. Their present method is to treat bladder tumors with a combination of fulguration and endovesical cystoscopic application of radium and deep roentgenotherapy. Some remarkable cures were obtained in large malignant papillomas.

DYSTROPHIA ADIPOSEGENITALIS

R. Torres-Carreras and Cervera, of Barcelona, reported a case of dystrophia adiposogenitalis of Froehlich in a male patient, seventeen years of age, who was treated by roentgen rays. A total dosage of three and one-quarter erythema doses to the skin and 1.12 erythema dose over the pituitary region was given. This was sufficient to correct the gynandromorphism, cause the growth of pubic and axillary hair and the development of the external organs, and transform the character of the patient. Radiation was given with small fields and only one-quarter erythema dose at a sitting. Thirteen treatments were given in nine months.

EARLY OSTEOMALACIA

C. J. Gauss, of Würzburg, Bavaria, noted that he had observed a number of women with pain in the sacral region, increased by movement and interfering with walking, and tenderness on pressure over the inner pelvic wall, especially the spinal ischiadicæ and posterior wall of the symphysis. The symptoms suggested beginning osteomalacia; yet the roentgen-ray examination was negative for any definite pathologic changes in the bones. The suspicion of an ovarian endocrine disease was strengthened by the fact that some of the patients also showed adiposis dolorosa. Proper treatment for osteomalacia resulted in relief or definite improvement in symptoms. Proof that these cases represented incipient osteomalacia was furnished in one case, in which the patient was not treated and later examination showed roentgen-ray evidence of typical osteomalacia.

48 EAST SEVENTY-FOURTH STREET.

Selected Abstracts

Myoma

Castano, Carlos Alberto: *An Etiologic and Pathogenic Study of Uterine Hemorrhages in Myoma and Hemorrhagic Uterine Affections.* La Presse Méd. Paris. 33: 1299, Sept. 30, 1925.

The author has studied this question for eight years, and thinks he has found the solution. Some writers attribute these hemorrhages to endometritis, some to other alterations of the endometrium. Castano is of the opinion that these theories are incorrect, being based on an erroneous interpretation of the histologic picture presented by the endometrium in uteri removed at operation, which picture is really that of a persistence of the premenstrual stage of the endometrial cycle.

The experiments were carried out on guinea pigs in rut, exciting the uterine mucosa either by incising the organ or by introducing foreign bodies (e.g., glass balls) into its cavity (method of Leo Loeb.) In one group the corpora lutea were not disturbed, in another they were destroyed by the thermocautery. In the first group artificial deciduomas (true placentomas) were formed at the incised points, with characteristic histology. In transplanted portions of the uterus decidual reactions were also noted, showing that the stimulus is carried by the blood stream. In the second group the uterine mucosa remained indifferent to the irritative stimuli, and no decidual reaction was manifested.

The author concludes that the corpus luteum is responsible for the uterine menstrual cycle, and that the hemorrhages observed in cases of fibroma and of metropathic conditions are due to hormonal alterations emanating from the corpus luteum, which bring about a state of permanence of the premenstrual stage of the menstrual cycle. Fibrous nodules (e.g., submucous fibroids) act as local irritants and excite the ovaries, causing a persistence of the lutein cells in the atretic follicles, which in turn produce the characteristic endometrial change above mentioned. Thus the hemorrhages under discussion are due to the ovary, and not to an endometritis or other local endometrial alteration.

E. L. KING.

Masson, James C.: *Parasitic Fibromyomata.* Surg. Gynec. Obst. 43: 645, 1926.

True parasitic fibromyomas are very rare and difficult to diagnose. Six cases are reviewed. A parasitic fibromyoma should be removed because it may interfere with the function of important organs and because malignant changes may develop. It may adhere to any of the lower abdominal or pelvic structures or some other part of the uterus itself, or the vaginal wall, and its removal may then become difficult.

WM. C. HENSKE.

Fullerton, William D.: *Fibroid Tumors of the Vulva.* Surg. Gynec. Obst. 40: 244, 1925.

Fibroid tumors of the vulva are uncommon. Leonard found but six cases in 23,000 gynecologic admissions to the Johns Hopkins Hospital, and during the past twenty-five years in 12,000 patients on a similar service at Lakeside Hospital, Cleveland, only 2 cases were observed.

The tumors occur almost invariably during the childbearing period, although they do occur later and have been observed in infants. Virgins and parous women seem to be equally affected.

They are first seen as small, firm, rounded and smooth or slightly lobulated, painless subcutaneous masses. Pedunculation is common, particularly in the larger tumors. Growth may be rapid, although it is more often slow. Degeneration and malignant transformations are more common in these tumors in this location than in similar tumors elsewhere in the body, probably because of their variable blood supply, pedunculation and position, which makes trauma more or less unavoidable. They originate in the connective tissue and may start anywhere in the vulvar structures or in the extraperitoneal portion of the round ligament or internal genitalia, and as they increase in size, they are forced into the line of least resistance down the inguinal canal or vagina and appear at the vulva.

The case here reported concerns a married, multiparous negress, twenty-four years old, who was admitted to Lakeside Hospital complaining of irregular vaginal bleeding for the past four years.

About four years ago she noticed a slight swelling just above the external urethral orifice. This had greatly increased in size. Since she first noticed the tumor, she has had irregular vaginal bleeding, never profuse. Since her marriage, one year ago, she has had moderate leucorrhea and some slight discomfort on voiding. For the past year she has had backache and more or less constant, though not severe, pain in her lower abdomen.

Immediately beneath the normal clitoris a rather soft tumor mass completely filled the vestibule and bulged forward depressing the urethra backward and downward into the vagina so that the external meatus was almost invisible. The mass was about 3 cm. in diameter, circular in outline, and extended well up under the lower edge of the symphysis. Gonococci were found in the pus expressed from the urethra. The uterine fundus was normal in size, retroflexed and adherent in the pelvis. The tubes were thickened and adherent. The left ovary was cystic, 6 to 8 cm. in diameter, and adherent. Wassermann negative.

First operation: A vertical incision was made from clitoris to meatus, tumor shelled out, some difficulty being experienced in freeing it up under the symphysis. Cavity and mucosa were closed with chromic catgut. Tumor proved to be a cellular fibroma.

Three days later, as the patient was doing nicely, a laparotomy was done and a chronic pelvic peritonitis revealed. Both tubes and left ovary as well as a badly adherent appendix were removed and the uterus suspended. Patient made an uneventful recovery.

WM. C. HENSKE.

Meyer, J.: A Case of Fibromyoma of the Tube. *Finska Läkaresällskapet's Handlingar*. 59: 43, 1927.

Myomas of the tubes are very rare, there having been only 39 observations recorded in literature. This patient, forty years old, noticed a mass in right lower abdomen, which occasionally caused some pain. In operation a fibromatous uterus was removed to which was attached a right tube, 12 cm. long, which contained a hard, nodular fibroid, the size of a fist.

AUTHOR'S ABSTRACT.

Shaw, W. Fletcher: Uterine Fibroids After the Menopause. *Brit. M. J.* 2: 919, 1927.

Shaw reports 65 cases of uterine fibroids after the menopause. He emphasizes the incidence of malignant disease and states that a uterus which contains

fibroids is much more likely to undergo malignant changes than one which is free from these tumors.

The writer analyzed the cases as to signs and symptoms and feels that it is much safer for a woman with fibroids of moderate large size to have the uterus removed before the menopause than run the risk of malignant or degenerative changes which so frequently appear after the menopause.

PROSHEK.

Seed, Lindon: Degeneration of Fibromyomata of the Uterus. Surg. Gynec. Obst. 41: 333, 1925.

Gross degeneration occurs in approximately 13 per cent of fibromyomas. Two hundred specimens of grossly degenerated fibromyomas of the uterus were reviewed and the degeneration classified as follows: hyaline, 24 cases; edematous, cystic, and myxomatous, 80; red degeneration with total necrosis, 33; calcification, 39; infected subserous and interstitial, 3; submucous, 13; miscellaneous, thrombotic sinus, 5; tuberculous, 1; and fibrolipomatous, 12.

Edematous, cystic, and myxomatous degeneration are a part of the same pathologic process, probably due to a gradual diminution in the blood supply. There are no clinical symptoms peculiar to it.

Red degeneration is an aseptic necrobiosis characterized by fatty degeneration, thrombosis of the vessels, extravasation of red blood cells and blood pigment. Pathologically it is a "red infection," and can be explained by a sudden complete vascular obstruction affecting chiefly the venous system. The end-result is a total fatty necrosis with transformation of the hemosiderin into hematin, and subsequent calcification. The occurrence of symptoms depends upon the size of the tumor and the acuteness of the necrosis. There is local pain and tenderness, and a mild toxemia.

Infection following necrosis of a submucous fibromyoma is very distinctive and probably accounts in itself for all symptoms.

Calcification, which occurs in two forms, the peripheral deposition in a totally necrotic fibromyoma, and the bone-like formation scattered throughout the tumor, has little clinical significance.

There is little evidence that the degeneration of fibromyomas produces a toxic effect on the other organs.

WM. C. HENSKE.

Schockaert: Degenerating Fibroid in a Woman Seventy-Nine Years of Age. Bruxelles-méd. 7: 959, 1927.

Schockaert reports a case of degenerating fibroid tumors of the uterus. The patient was seventy-nine years old. Until four weeks before operation when there appeared a copious sero-sanguinous discharge, the tumor had given rise to no trouble other than mild pressure symptoms. A supra-vaginal hysterectomy was performed under spinal anesthesia. The convalescence was normal and rapid. In concluding, the author calls attention to the necessity of observing carefully fibroid tumors which are giving rise to no trouble, because of the possibility of degeneration. Such observations should be continued, even after the menopause.

THEODORE W. ADAMS.

Nisot: Suppurating Fibroids. Bruxelles-méd. 7: 593, 1927.

The author reports two cases of infected fibroid tumors of the uterus. The first case illustrates the danger of operating on these cases too early, especially where the infection has spread to the surrounding organs. In this instance the

patient died on the second postoperative day. On the other hand, the second case points out the dangers of extreme conservatism where the infected nodule is intramural and limited to the uterus. In this latter type of case Nisot feels that hysterectomy is the procedure of choice. In the former instance the virulence of the infection should just be attenuated by rest in bed and ice caps to the lower abdomen. The use of autogenous vaccines may also be of aid. If it is felt that drainage can be established by vaginal puncture, this procedure should be carried out.

THEODORE W. ADAMS.

Patel and Denis: Necrobiosis of Uterine Fibroids. *Gynéc. et Obst.* 17: 11, 1928.

The condition consists in an aseptic necrosis following nutritional disturbance of the fibroma. Its relative rarity explains the prevalent uncertainty regarding its evolution and its relation to suppuration and gangrene. It is frequent in pedunculated fibroids, but not due to torsion, which condition is generally associated with gangrene and infection. In its true aseptic form, it occurs most commonly in subperitoneal and interstitial fibroids. The usual age is from thirty to fifty, and the condition frequently accompanies pregnancy. The causative ischemic factor has been attributed to strangulation of the tumor by its capsule, thrombosis of capsular veins, or to a special type of circulation characterized by a central terminal artery. The point of election is approximately the center of the tumor. The so-called "red fibroid" is considered to be an acute type of the same condition. The important characteristic is the complete absence of infection as a primary factor. The process may proceed to calcification with little clinical manifestation, or may show practically no change over a protracted period. In either case the clinical picture is often that of some general debilitating condition without local manifestation. On the other hand, the cavity may rupture into the fundus with secondary infection and a suggestive discharge; or secondary infection may occur without rupture. In this event the process assumes the character of a definite focus of infection, but will manifest itself less readily according to its situation in the uterine wall. Rupture of an infected cavity into the fundus is apt to cause amelioration of the symptoms. The diagnosis is difficult but the more or less definite appearance of pain and tenderness and softening in the region of a known uterine fibroid together with slight fever, malaise, etc., is suggestive. Vague general symptoms in the presence of known fibroids should suggest such a possibility even in the absence of local findings. In connection with pregnancy, complications following delivery, or abortion in the presence of fibromas, may be due to infection of a necrotic cavity.

The prognosis is relatively good, infection being infrequent. Treatment is essentially surgical. Subtotal hysterectomy or occasionally myomectomy is indicated. In pregnancy, artificial termination is not indicated, short of serious signs. At term cesarean section followed by hysterectomy or occasionally myomectomy should be the rule.

GOODRICH C. SCHAUFFLER.

Frankl, O.: Inflammatory Changes in Myomata. *Monatschr. f. Geburtsh. u. Gynäk.* 76: 27, 1927.

Inflammatory changes frequently occur in myomas especially in submucous ones. Less frequently are subserous myomas infected, usually from the intestines or adherent inflamed adnexa. Interstitial fibroids are very rarely infected and the author reports two such cases from a series of 2000 specimens of interstitial fibroids.

The first specimen was from a twenty-eight year old woman who was about eight weeks pregnant at the time of operation. Cultures from the degenerated myoma showed nonhemolytic streptococci but no organisms were found in the tubes, endometrium or peritoneum. The infection in the fibroid was most likely a hematogenous one from the patient's throat for she had had angina a few weeks before the operation.

The second specimen was obtained from a fifty-two year old woman. No bacteriologic studies were made in this case but a hematogenous infection is assumed for this one also. Neither of the two patients had any fever before operation.

J. P. GREENHILL.

Ulesco-Stroganowa, K.: A Case of Multiple Myomata With Malignant Degeneration in Several Nodules. *Arch. f. Gynäk.* 131: 34, 1928.

This tumor, removed from a fifty-nine year old patient, was peculiar in that there were present many nodules made up of completely differentiated muscle fibers intermingled with many nodules made up of cells similar in structure to the type of cells found in spindle cell sarcomas. There were also many nodules found in which the cells represented various gradations of development and structures between these two extremes. Apparently the developmental differentiation of the muscle cells of this tumor was interrupted at different stages from the early embryonic stages to the mature stage.

RALPH A. REIS.

Imhäuser, K.: Frequency and Valuation of Myosarcoma of the Uterus. *Arch. f. Gynäk.* 123: 12, 1924.

Since the advent and perfection of roentgen-ray therapy in the treatment of myomas, this method has supplanted all other methods in many clinics. This type of therapy is based on the assumption that retrogression of the tumors follows roentgen destruction of ovarian function. Sarcoma of the uterus must, therefore, be a contraindication to the use of the roentgen ray since the dose used to destroy ovarian function would have a stimulating effect rather than a destructive effect upon an actively growing sarcoma. In the Giessen clinic between 1918 and 1923, there were 208 cases operated upon for myomas, and among them were 11 diagnosed microscopically as sarcoma.

The symptomatology of sarcoma is very indefinite, only 6 had bleeding during the menopause, 5 had lost weight and several had had pain. Of 11 cases previously treated by roentgen therapy, and subsequently operated upon because the symptoms had not subsided, 2 had sarcomas. The myosarcomas all felt soft and often resembled pregnancy. Rapid growth of a tumor is suspicious and one quarter of all cases operated upon for a rapidly growing tumor proved to be sarcoma.

The author concludes from his studies that a differential diagnosis between sarcoma and myoma cannot be made clinically and that 6 per cent of myomas operated upon proved to be sarcoma. He recommends, therefore, that all myomas be given a full sarcoma dose of roentgen ray, rather than a dosage which would only destroy ovarian function. Only by this method can myomas be safely treated by roentgen therapy.

RALPH A. REIS.

Deaver, J. B., and Reimann, S. P.: Treatment of Uterine Fibroids; With Remarks on Pathology of Fibroids. *Ann. Surg.* 82: 486, 1925.

Should all fibroids producing symptoms be removed in the absence of grave constitutional contraindications or grave local disease not produced by the fibroid

itself? His reply to this is decidedly in the affirmative. He has never considered the fibroid a simple tumor, nor even in the absence of symptoms is it harmless. Many of these tumors elaborate toxins which cause degenerative changes in the heart and other organs. This fact of itself is sufficient reason for removing the tumor.

How should the fibroid be treated, by surgery, radiation, or perhaps both? In the author's opinion, the removal by operation is the safest procedure unless there are grave contraindications to operation. His objections to the use of x-ray and radium are: (1) The length of time necessary to accomplish a cure, (2) The risk of destroying the function of the ovaries, (3) The toxicity caused by radium and x-ray, (4) The deformity of the skin, (5) Furthermore, the pathologic tissue which remains behind, the future of which cannot be definitely forecast, (6) The blood does not return to normal as promptly as after operation. On the other hand, he considers in favor of operation (1) the low mortality of 2.1 per cent in 502 cases, (2) the ovaries if not diseased can be left, and (3) the woman has nothing to dread in the shape of degenerative changes in a questionable residuum. He has found that fibroids do not decrease in size after the menopause but usually do the opposite.

Whether a total, subtotal, partial hysterectomy or a myomectomy is to be done depends upon the size and location of the fibroid and the complications present. Myomectomy is especially indicated in young women, in single isolated fibroids, and in pedunculated fibroids. Contraindications to this operation are multiple tumors; extreme anemia, inflammatory diseases of the uterine appendages, multiple and large interstitial tumors. The type of hysterectomy depends upon the age of the patient, the condition of the cervix and of the uterus, the size and site of the tumor, its topography, and the complications present in the shape of diseased adnexa, and entanglements with neighboring organs. For fibroids developing during or after the menopause, particularly when the condition of the cervix is questionable and there is reason to suspect commencing degenerative changes in the uterus, total or complete abdominal hysterectomy is the operation of choice.

ADAIR AND ARMSTRONG.

Aschner, B.: The Advantages of Conservative Operations for Myomata Over Radical Operations or Roentgen Castration. *Wien. klin. Wchnschr.* 38: 699, 1925.

The author asserts that radical operations and roentgen castration should be replaced by the more conservative myomectomy because of bad effects following radical methods. During the past five years he has carefully followed 104 cases treated by supravaginal hysterectomy, by total hysterectomy with or without removal of the ovaries, and by radium or x-ray radiation and found among them not only the usual complaints and ailments resulting therefrom, but also cases of hypertension, cardiac dilatation, vessel spasms, myocardial degeneration, palpitation, painful carotid pulsation, gouty diatheses and subcutaneous hemorrhages as well as gastric, pulmonary, submucous and ocular hemorrhages. He also found Meniere's disease, all types of neuroses, nerve diseases, facial palsies, psychoses, glaucomas, and certain diseases of the skin following the radical methods of treatment. He, therefore, is emphatic in the belief that even though close to the menopause, the future condition of the patient should be considered more than at present and, except in the presence of malignancy or tuberculosis, the menstrual function should be preserved as long as possible. The operation of choice therefore is myomectomy.

The author has repeatedly proved that many cases of hemorrhagic metropathies may be successfully treated by medical means such as regulation of

the gastrointestinal tract, by hydrotherapy and by venesection. Styptics applied to the uterine mucosa and curettage are also highly effective. Conservative and medical treatment should always be especially directed toward the etiologic factors such as pelvic congestion, obstipation, plethora, dyscrasia, metabolic disorders, autointoxication. The conservative operative procedures employed by the author are curettage and fundal resection.

While the tendency toward more conservatism in the operative treatment of myomas is spreading, the profession is still far from attaining the dictum of Martin "that every myoma should be removed without disturbing the menstrual function." Small myomas, if not increasing rapidly, as well as those which do not produce symptoms, had best be treated expectantly. Those which produce symptoms or are growing rapidly should be removed by an intracapsular enucleation even though large in size or multiple. The author has had 65 cases during the past six years and has been able to conserve the menstrual function in all of them thus assuring a normal menopause with freedom from serious complications. The author does not hold to the common belief that conservation of the ovaries suffices. He always uses the abdominal route wherever possible because of the better opportunity for accurate resection, control of hemorrhage and accurate peritonealization.

RALPH A. REIS.

Giuseppi, P. L.: *The Treatment of Uterine Fibroids by Myomectomy.* Brit. M. J. 2: 1220, 1925.

It should be an axiom for every surgical intervention that an innocent tumor should be removed but the organ which contains it preserved, unless the removal of the tumor alone is a more dangerous operation, or the organ that is left is useless. Myomectomy must from its very nature be a higher ideal than hysterectomy, whether total or partial.

The indications for myomectomy are: (1) The fact that the woman is of childbearing age. (2) All pedunculated and single tumors should be removed and the uterus left. (3) There are cases in which hysterectomy would otherwise be indicated, but in which there are so many adhesions between the womb and other organs that myomectomy is the easier and safer operation. (4) Some patients object to the loss of the uterus.

The contraindications are as follows: (1) If the patient is above childbearing age; (2) Neither the number nor the position of the tumors should debar us from performing myomectomy; (3) Coexisting disease of the ovaries and tubes; (4) If malignant or septic degenerations are present.

Myomectomy is indicated during pregnancy under the following conditions: (1) When preexisting tumors grow rapidly; (2) when acute pain is produced by red degeneration; (3) when pressure symptoms make life a burden; (4) when the position of the tumor makes it almost certain that it will produce obstruction during labor.

F. L. ADAIR.

Goinard, E., and Goinard P.: *Myomectomies.* Rev. franç. de gynéc. et d'obst. 23: 353, 1928.

Myomectomy is the most conservative treatment of fibroids and should frequently be practiced. Intrauterine exploration will sometimes reveal that an apparently interstitial fibroid is in reality a submucous one and may be extirpated vaginally. Laparotomy and especially exploratory abdominal hysterotomy will indicate the advisability of simple myomectomy in many cases. Youth and desire for children should make the surgeon favor myomectomy provided this operation does not entail any risk. In each case the dangers of myomectomy

must be compared with those of hysterectomy but preliminary dilatation of the cervix, exact suturing, and tamponade lessen the hazard of myomectomy.

J. P. GREENHILL.

Ott, von, D.: Supravaginal Amputation of the Myomatous Uterus or Total Extirpation. *Monatschr. f. Geburtsh. u. Gynäk.* 78: 108, 1928.

Panhysteromyomectomy is the operation of choice for a fibroid uterus. During the last few years Ott has had absolutely no mortality. He believes that the cervix alone serves no purpose for it does not help support the vagina. The author has never had a case of prolapse of the vagina after total extirpation. In some instances unless the cervix is removed the operation is useless. This is true when there is gangrene of the tumors and when carcinoma is present in the cervix. Not infrequently when the cervix is left behind, small myomatous nodules are in the cervical stump and these may grow sufficiently to necessitate subsequent removal of the cervix. According to the author there are more complications after supravaginal hysterectomy than after panhysterectomy. He prefers the vaginal to the abdominal operation and even large fibroids may be removed by morcellation.

J. P. GREENHILL.

Essen-Möller, Elis: One Thousand Laparatomies for Myoma of Uterus. *Surg. Gynec. Obst.* 46: 187, 1928.

In one thousand of 2012 cases of myoma observed during a given period, operation was done, i.e., in about 48 per cent. The indications for operations were hemorrhage in, 494; pain in, 159; growth in, 119; mechanical factors in, 82; size of tumor in, 16; gangrene or infection in, 11; profuse discharge in, 12; cystic degeneration in, 16; torsion in, 4; suspected malignancy in, 16; simultaneous adnexal affection in, 40; faulty diagnosis in, 31 cases. The methods of operation were: Supravaginal amputation in, 799; total extirpation in, 117; enucleation in, 49; and extirpation of pedunculated myoma in, 35. In examination of the removed myoma there existed a myoma plus sarcoma in 18, myoma plus cancer of cervix in 2, myoma plus cancer of uterus in 5, myoma plus cancer in tubes in 1 case, and myoma plus cancer of ovaries in 3 cases. The conclusion reached with regard to the choice in method of operating is this: If in a patient, before, during, or after the menopause, a uterine tumor begins to change, to increase in size rapidly, to produce more abundant hemorrhage, and to be painful, and if the patient is losing flesh, then malignancy ought to be suspected and total extirpation should be done. As a matter of course, the degeneration may be of another kind, but even then the tumor ought to be removed and total extirpation is safer. Primary mortality was found to be due: To pulmonary embolism in, 13; infection in, 4; pneumonia in, 1; endocarditis and pleurisy in, 1; endocarditis and cephalitis in, 1; urine infiltration (lesion of the bladder first discovered at autopsy) in, 1; chronic anemia in, 1; miliary tuberculosis in, 1; suffocation (aspiration of vomited contents of stomach) in 1 case. Complications such as concurrent adnexal disease diagnosed before operation should be of great importance. Their nature in this series was as follows: Ovarian or para-ovarian tumor, 42 cases; malignant ovarian tumor, 3; hydrosalpinx, 3; pyosalpinx, 8; tuberculosis, 10; extrauterine pregnancy, 2; tubal cancer, 1 case. Intra-uterine application of radium to myoma in 103 cases gave the following results: Diminution in size of the tumor was noted in 60 cases, a favorable influence on hemorrhage in 87, but in 15 cases infection set in. For some reason or other 12 patients had to be operated upon later and 3 patients who were free from cancer before treatment were found to have it later. X-ray was used in 51 cases and it was observed that immediately or after renewed treatment hemorrhage had ceased in 6 per cent and that in 9.8 per cent operations later had to be done.

WM. C. HENSKE.

Miscellaneous

Spencer, Herbert R.: *The History of British Midwifery (1650-1800)*. Brit. M. J. 2: 853, 1927.

It may be said that during the one hundred and fifty years after Harvey published his *De Generatione Animalium* a great advance was made in the science and art of midwifery. This was chiefly due to the introduction of male practitioners, many of whom were men of learning and devoted to anatomy, the groundwork of obstetrics. The institution of lying-in hospitals by these male practitioners had an important influence in promoting teaching and research. The general introduction of the use of the forceps placed in their hands means, previously unknown, of delivering women, and by its results gradually overcame the opposition of the midwives, surgeons, and physicians to the new class of men-midwives. The action of the College of Physicians in instituting a special diploma of "Licentiate in Midwifery" was not without influence in improving the status of those practicing midwifery, although it ceased to be granted in the year 1800.

The characteristic of British midwifery at this period was conservatism. Although by some practitioners carried to excess, it led to laudable attempts, exclusively British, to avoid the operations of craniotomy which sacrificed the child, and of cesarean section and symphyseotomy which so often proved fatal to the mother.

The forceps were sometimes used unnecessarily then, as now; but the abuse of operative methods of delivery is much greater at the present time, and no better corrective of that abuse could be prescribed than a study of the careful records of the British obstetricians of the seventeenth and eighteenth centuries, showing the resources of that "perfect operatrix," Nature, in effecting delivery.

DR. PROSHEK.

Causes of Sickness Among Males and Females at Different Ages. United States Public Health Service. August 15, 1928.

That the human female is more often sick than the male, in spite of her longer average duration of life, is one of the apparent anomalies shown by available sickness records for adult persons and by mortality records.

The U. S. Public Health Service recently undertook to inquire a little more closely into this excess of the sickness rate among females. It was found that the higher female sickness rate did not hold true for children under ten years of age. Boy babies and small boys were apparently more subject to infectious diseases and to diseases of the eyes and ears, skin, to colds and other respiratory conditions, and to digestive troubles, than were girls of the same age. But as soon as the adolescent period of life began, the sickness rate of the girls became higher than that of boys and the female rate for practically all diseases was actually higher than that of the males throughout adult life. Women suffer more than men from sicknesses due to the common types of respiratory diseases, to digestive and nervous disorders, and to diseases and conditions of the kidneys and heart. This in spite of the fact that the death rate among older women is lower than that of older men.

Lhermitte, J., and Dupont, R.: *The Innervation of the Ovary.* Gynéc. et Obst. 15: 161, 1927.

The authors have made an exhaustive study of the innervation of the ovaries in the interest of destroying it for the purpose of gaining relief from ovarian distress. It was found that the best method of approach was through an inci-

sion parallel to the long axis of the ovary through the visceral peritoneum of the posterior fold of the broad ligament at the hilus of the ovary. Through this the vessels and nerves are easily exposed and all except arterial structures are ligated and cut.

The operation is very simple and in the hands of these operators has cured 10 out of 15 patients of complaints said to be of ovarian origin. Only 2 patients were apparently not relieved. They conclude that the destruction of its innervation does not harmfully affect the ovarian functions and that it obviously gives extremely interesting results in suppressing so-called ovarian pain.

GOODRICH C. SCHAUFFLER.

Ostendorf, L.: Blood Sedimentation. Its History, Its Theory, and Its Clinical Significance. *Monatschr. f. Geburtsh. u. Gynäk.* 77: 359, 1927.

The blood sedimentation time varies considerably even under physiologic conditions as shown by the following rates: umbilical cord blood, ten to twenty-four hours; male blood, six to nine hours; female blood, five to six hours; but during menstruation it is from one to two hours faster and during the latter months of pregnancy, during the puerperium and lactation the time varies between twenty and one hundred and twenty minutes. In the newborn under one month the time is seven hours and above one month it is one and a half hours. In pathologic conditions the most rapid rate is that in the presence of inflammation when it may sink to five or ten minutes.

The blood sedimentation test has found its greatest usefulness in the field of gynecology. The author used the test in 625 cases and found it useful in the following ways: (1) to determine the time to operate in cases of chronic inflammation of the adnexa; (2) to guide conservative treatment in cases of inflammatory adnexa, because when the sedimentation time rose, rest was necessary and when the sedimentation time fell, resorptive therapy was indicated; (3) to differentiate between inflammatory disease and tubal pregnancy; (4) to differentiate between appendicitis and salpingitis, for the sedimentation time in appendicitis does not fall for about thirty hours; (5) in cases of carcinoma it gives some information about the persistence of cure, because after operation or radiation the sedimentation time should gradually decrease and become normal at the end of a year.

J. P. GREENHILL.

Sakuma, H.: Experimental Study of the Excretory Functions of the Mucous Membrane of the Uterus, *Jap. J. Obst. & Gynec.* 10: 43, 1927.

The following results were obtained with regard to pigment excretion in the uterine mucosa. Out of twenty kinds of acid pigments and ten of basic pigments, only five pigments, i.e., trypan-blue, trypan-red, toluidin-blue, Congo-red, uranin, were found to be excreted by the uterine mucosa. Trypan-blue, toluidin-blue, trypan-red and Congo-red were quickly secreted, but when 1.0 gm. of a 2 per cent watery solution was injected into the vein of a rabbit weighing 100 gm., no excretion was recognized, which indicates the weakness of the function. When the smallest possible quantity of the pigments is used, trypan-blue is observed to commence its traceable passage one hour after injection of the pigment, toluidin-blue three hours after, trypan-red and Congo-red six hours after injection. The excretory function in the uterine mucosa is slow and comparatively long in duration. Those pigments that are not observed to be excreted within twenty-four hours after the injection are not excreted even after that time.

All the pigments which are excreted can stain the uterus in the living organism. Trypan-blue shows the most remarkable passage, as it has the strongest power of discoloration.

In the secretion of pigment in the uterine mucosa, the degree of diffusion of the pigments has nothing to do with the difficulty and speed of excretion.

Castration of the ovaries decreases the excretion of pigments by the uterine mucosa, while excitation of the ovarian function produced by ovarian preparations or by ovarian transplantation has no effect on the excretion. Pilocarpine has no marked influence on the excretion of pigments in the uterine mucosa, but atropine causes a decrease in the quantity of pigment excreted.

When adrenalin is injected repeatedly every thirty minutes, the concentration of the pigment secreted is lessened, but when one hour and a half have elapsed after the first injection of adrenalin, the excretion of pigment, on the contrary, is observed to show a sudden acceleration.

When Congo-red is injected, very minute granules of red pigment are observed to be scattered in the protoplasm.

On the fifth to sixth day of the puerperium, the excretion of pigment in the uterine mucosa is greater than that in the normal uterus, but only to a slight degree.

J. P. GREENHILL.

Sakuma, H.: Pathologic and Histologic Changes in the Uterine Mucosa Due to Various Kinds of Poisons. *Jap. J. Obst. & Gynec.* 10: 50, 1927.

Repeated subcutaneous or intravenous injections into rabbits of as small a quantity as possible of lead, mercury, silver, iron, arsenic, phosphorus, nicotine and chromium produce pathologic changes in the uterine mucosa. These changes are not due to the excretion of these substances in the uterine mucosa, and on the other hand the pathologic conditions are not the result of debility and exhaustion produced by these poisons. The author has proved that a small amount of iron is excreted by the endometrium, but not silver and chromium. He has no definite information concerning the other substances. Lead, nicotine, mercury, and phosphorus produce extensive degenerative changes in the ovaries but arsenic, silver, iron, and chromium have very little effect. The changes in the ovaries differ from those in the uterus because these chemical poisons have an elective action on different organs.

J. P. GREENHILL.

O'Keefe, C. D.: Relation of Hypothyroidism to Obstetrics and Gynecology. *South. M. J.* 20: 375, 1927.

There are five hypothyroid hazards in a woman's life: namely, puberty, pregnancy, menopause, operation, and infection. The patients present characteristic histories, physical findings, and metabolic changes so that the diagnosis is easy. The writer feels that infections, pregnancies, abortions, and miscarriages play an important rôle in the etiology of thyroid deficiency, the hypothyroidism in turn having a marked influence on pregnancy and sexual life in general. Severe menopausal disturbances are due to glandular deficiency in general and to thyroid in particular and not alone to ovarian death. Relief from these disturbing symptoms may be obtained through thyroid medication in practically all cases. The cure depends upon the duration of the disease

A. C. WILLIAMSON.

The Readers' Forum

CONDUCTED BY JOHN OSBORN POLAK, M.D.

Readers of the Journal are urged to avail themselves of the facilities afforded by this department for replies to questions in the domain of obstetrics and gynecology. All inquiries should be directed to Dr. John O. Polak, 20 Livingston Street, Brooklyn, N. Y. Replies to such inquiries will be published as soon as possible in this department.

January 8, 1929.

Dr. Julius Levy of the Bureau of Child Hygiene, New Jersey State Department of Health, Trenton, N. J., writes us:

"We are carrying on a demonstration for prenatal care with a group of physicians. One of the routine measures we have asked them to carry out in the prenatal clinic is to take a vaginal and cervical smear to determine the presence of gonorrhea.

"They have objected to this procedure on the ground that there is no purpose in determining the presence of gonorrhea in a pregnant woman, as her condition makes it undesirable to institute treatment and that it is apt. to lead to miscarriage."

Should smears from the vagina and cervix for gonococci be taken as part of the routine in prenatal examination, is a question which concerns everyone practicing obstetrics.

Occasionally a woman conceives, and contracts gonorrhea at her first coitus. More frequently, however, the woman becomes infected by her husband during the course of pregnancy. These make up the two classes of acute cases which are met with in prenatal clinic or antepartum practice. The clinical symptoms are so clear, and the discharge so profuse and characteristic that the diagnosis can easily be made, confirmed by smears taken from the urethra or vaginal entrance.

Treatment in these acute cases consists of rest in bed, postural drainage, vulva cleanliness, vaginal irrigations and the free exhibition of alkaline waters. After the acute stage has passed, the following local treatment may be employed without fear of abortion, after the vagina is irrigated with a weak permanganate solution. The patient should be placed in the knee-chest position and the vaginal walls and the portio exposed with the Sims speculum. These areas are then cleansed with pledgets of sterile cotton and the entire mucous surface of the portio, vagina, introitus, and meatus painted with a 10 per cent mercurochrome solution which is allowed to dry. Should cleansing douches be used, warm alkaline irrigation with a bag or can at low elevation accomplishes all that is needed.

Chronic gonorrheal lesions of the cervix cannot be cured during pregnancy, nor can the gonococcus be recovered by smears taken from the cervix of the pregnant woman in any large proportion of cases which have a history of neisserian infection. While we believe that chronic gonorrhea is extremely prevalent among the women attending hospital clinics, and that labor and the puerperal discharge are often sufficient to induce activity in these apparently dormant organisms, and that the presence of the gonococcus may also predispose by symbiosis to streptococcus infection during the puerperium, we are also reasonably certain, from our individual experience, and from a careful review of the literature, that gonococcus cannot be

recovered by smears with sufficient frequency to justify the risk of disseminating infection beyond the sterile zone. If the cervical lesion is extensive the woman will be sterile, if not, and she becomes pregnant, the cocci are latent and do little harm in the puerperium in properly managed cases.

Finally: The child is safeguarded in the presence of neisserian infection whether treated or untreated by the instillation of a silver solution into the conjunctival sac. The omission of this precaution is costly, even in labors where no gonococci can be obtained by smear or culture. We believe, therefore, that the objection to this routine procedure is well founded, for why do something that gives neither information to the physician, nor protection to the patient?

Books Received

TROUBLES FONCTIONELLES ET DYSTROPHIES EN GYNECOLOGIE. Par Paul Petit-Dutaillis, chirurgien de l'hôpital privé Saint-Michel. Avec 185 figures dans le texte. Paris, Gaston Doin & Cie, 1928.

HANDBUCH DER GESAMMTEN STRAHLENHEILKUNDE, BIOLOGIE, PATHOLOGIE UND THERAPIE. Herausgegeben von Professor Dr. Paul Lazarus in Berlin. In zwei Bänden. Zweiter Band, erste und zweite Lieferung. München, Verlag von J. F. Bergmann, 1928.

METHODS AND PROBLEMS OF MEDICAL EDUCATION. Tenth series. The Rockefeller Foundation, New York City, 1928.

Erratum

In the article by Jarcho entitled "Changes in the Leucocytes During Labor and the Puerperium," which appeared in the January, 1929, issue, in the second paragraph under Table I, on page 18, certain lines of type have been transposed. The paragraph should read:

Twenty-three cases of normal labor were studied with respect to the differential blood counts. Space does not permit of a detailed report of the results, but an average of the total figures is given in Table I.

The American Journal of Obstetrics and Gynecology

VOL. XVII

ST. LOUIS, MARCH, 1929

No. 3

Original Communications

THE THERAPEUTIC VALUE OF A NEW CONCENTRATED STREPTOCOCCUS ANTITOXIN IN PUERPERAL FEVER*

BY A. F. LASH, M.S., M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology, University of Illinois, College of Medicine and the Cook County Hospital)

THE name, puerperal fever was first suggested by Richard Morton in 1692 to apply to a febrile condition in puerperal woman. Although the term is not precise and as vague as the knowledge of the condition was at the time it was first used, yet it has been retained to this day. It included a vast number of clinical entities giving fever during the puerperium, some of which are entirely unrelated to childbirth, such as pneumonia.

In this study puerperal fever will be considered as an acute infection of the female generative tract producing an acute inflammation of the uterus and its surrounding structures. The fact that various bacteria may be the cause of different pathologic and clinical pictures has not altered the nomenclature. Inasmuch as the term has reached such general acceptance, it will be used here also, with additional descriptive terms to specify the causative organism and the predominant pathologic picture. In the strict sense the term, puerperal fever, should be applied to an acute febrile condition occurring early in the puerperium with the pathologic picture of acute endometritis, which usually becomes associated with myometritis, salpingitis, parametritis, pelvic peritonitis and pelvic thrombophlebitis and may lead to generalized peritonitis, septicemia, septicopyemia or pelvic abscess. Principally, that type of puerperal fever due to the streptococcus will be considered in the following report.

*Read at a meeting of the Chicago Gynecological Society, May 18, 1928.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

That the streptococcus is responsible for the majority of the severe puerperal infections has been known since Mayrhofer, in 1865, found the organism in smears from the tissues and Pasteur, in 1878, cultivated it from fatal cases. Further evidence of the etiology has been presented from time to time by the occurrence of puerperal fever in maternity hospitals in epidemics which were traced to a streptococcus infection. By analogy with other known streptococcal infections, such as scarlet fever and erysipelas one would logically expect advances in specific therapy. Up to the present time these have not occurred, and as a matter of fact the treatment of puerperal fever has not decreased its mortality.

The history of serum therapy in puerperal fever has been well related by Bailey in 1924, and therefore requires no detailed repetition. Only a brief summary with some additions will be given. In 1895 Marmorek produced the first streptococcus polyvalent serum. Other investigators (VandeVelde, Aronson, Neufeld and Rimpau, Meyer and Ruppeld, and Bar and Tissier) used polyvalent serums but the results were not encouraging. Meyer thought that he prepared a serum of antitoxic as well as bactericidal powers when he immunized an animal with a mixture of streptococci and their specific bactericidal serum. He assumed that the streptococci were dissolved in the serum thereby liberating endotoxins. However, Aronson disagreed with this assumption, since he demonstrated that the streptococcus could not be dissolved by body fluids, as could typhoid or cholera bacillus, but is rendered innocuous solely by phagocytosis. This impression is confirmed by the observation made in one of the cases (M. S.) reported below in which a viable streptococcus hemolyticus was cultivated from a tubo-ovarian abscess months after the infection.

According to Bailey, Park in 1909 utilized a number of strains of streptococci recovered from women dying of puerperal fever. The serum from the one horse injected was used for several years. Upon the death of this animal the work was discontinued. As no decided clinical evidence of the therapeutic value of the serum was published and as no bacteriologic diagnosis of the cases had been made, this work is of little or no significance.

Krongold-Vinover in 1921 infected horses with streptococci obtained from human sources and procured the serum fourteen or fifteen days later. A prophylactic injection of 0.1 c.c. of this serum into a mouse twenty-four hours before infection protected the animal against a dose of streptococci representing one hundred times the lethal dose. He introduced into puerperal fever patients on the first day, 20 c.c. of the serum with 180 c.c. of saline solution intravenously, on the second day 30 c.c. of serum with 270 c.c. of saline, and on the third day 40 c.c. of serum with 360 c.c. of saline. He reported 38 patients cured, in a series of 41 who showed streptococci in the cervix, and 2 out of 5 who had streptococci in the blood.

Zangemeister and Meissl employed human convalescent serum with good results. However, the obtaining of human sera for therapeutic purposes is difficult. Besides, Aronson and Heyneman were unable to show experimentally any advantage of the human sera over that of the horse.

Bailey (1924) used large doses (100 c.c. or more) of unconcentrated serum from a horse immunized with a mixture of strains which included the majority of hemolytic streptococci not only according to the serologic classification but also from the disease sources. In a series of 13 cases, there was a mortality of 15.3

per cent. From the history abstracts there was not in all cases evidence that the infection was in the uterus or due to the streptococcus.

From the report of a committee of the North of England Section at the fifth British Congress of Obstetrics and Gynecology of April, 1925, 104 cases were treated with serum combined with or without other operative procedures, with a mortality of 72 per cent while in 47 cases treated with serum alone the mortality was 76.5 per cent.

An attempt to determine the present status of antistreptococcus serum therapy in this country was made by E. Novak in 1926. The analysis of the questionnaires indicated that little reliance was placed on the commercial antistreptococcus serum.

Following our reports (Lash and Kaplan) of toxin production by the hemolytic streptococcus isolated from the blood of women with puerperal fever, and antitoxin production in rabbits, there appeared a report from Germany (Warnekros, et al) of the use of an antitoxic serum in the surprisingly large number of 200 women with severe puerperal fever, with the astounding result of no mortality. There was no evidence presented as to the causative bacteria or the stage of the infection.

The latest report of a streptococcus antitoxin used in puerperal fever is that of Gaessler's coming from the same clinic as the preceding one. In 341 obstetrical cases and 59 abortions, the serum was injected intragluteally in doses of 50 c.c. which were usually repeated daily until a fall in temperature occurred. There were 20 deaths, but of these only 3 were considered attributable to failure of the method.

In June of 1925 we (Lash and Kaplan) reported the production of toxin by hemolytic streptococci isolated from the blood of women with puerperal fever; later, we succeeded in preparing an antitoxic serum in rabbits. Efforts were then made to produce sufficient antitoxic serum in larger animals, such as sheep and then goats. It was soon found that sheep serum was toxic to humans as determined by intracutaneous injections, and that goats were unable to furnish sufficient serum for an extensive clinical study. With the cooperation of Dr. M. M. Powell and Mr. W. A. Jamieson, director of the biologic laboratories of Eli Lilly and Company, the above obstacles were overcome by immunizing horses.

One of the horses was immunized with increasing doses of toxin while the other was immunized with both toxin and organisms. Twelve strains of *Streptococcus hemolyticus* were used. These were isolated from women with puerperal fever and were determined to be toxin producers. The serum obtained neutralized the toxin of these strains as shown by cutaneous tests (Dick method). As yet, there is no evidence of a specific streptococcus for puerperal fever. However, it is logical to assume that bacteria, like all living matter, are probably altered by their environment and that streptococci isolated from infected puerperal uteri and the circulating blood may have a greater degree of

specificity in producing an antitoxic serum for puerperal fever than those found in other infections. This is only a working hypothesis.

In time, it was found that the serum obtained from the horse immunized with the toxin and streptococci had a higher antitoxin potency than that secured from the horse immunized with the toxin alone. This observation confirmed our earlier experimental studies (Lash and Kaplan).⁹

In addition to specificity and potency another desirable feature to be attained in serum preparation is the elimination of the frequent and severe serum reactions which occur when large doses of unconcentrated serum are used. The first cases treated with unconcentrated serum suffered from reactions which were avoided when the serum was concentrated.

In the following study the presence of a fever in a puerperal woman was not in itself sufficient reason for administration of serum, as it is not an uncommon occurrence for a puerperal woman to have a temporary fever with no other symptoms to establish its etiology. Only patients with definite evidence of infection in the uterus and pelvic tissues, such as pain and tenderness over the corpus with or without parametrial tenderness, together with fever and leucocytosis, were treated with serum. All stages of infection were treated as the purpose of this study was to evaluate, if possible, the new antitoxic streptococcus serum in puerperal fever in its various pathologic states.

Fifty-seven women in various stages of puerperal fever were given serum-therapy. The difficulty of separating accurately the various anatomicopathologic stages in puerperal fever during life is obvious. However, the fact that clinically one stage usually predominates, permits a classification which is of value for practical purposes. Of the cases treated, there were 20 of uncomplicated acute endometritis and metritis, 20 of acute endometritis and parametritis, 10 of pelvic peritonitis and generalized peritonitis, 3 of parametritis and thrombophlebitis, 4 of embolic pulmonary complications, and 2 of extrapelvic pathology simulating puerperal fever. This classification based on the predominating lesion is followed in Tables I to VI which contain a brief abstract of each case. Table VII contains a group of puerperal fever patients who did not receive any of the antitoxin.

In the administration of the puerperal fever antitoxin the usual precautions of serum-therapy must be observed. If a history of previous hypersensitiveness to serum is present, desensitization should be carried out. As to the route of injection, the intravenous one is preferred for rapidity of effect, but carries a greater risk of reaction than the intramuscular method. The dose of the serum has been very appreciably decreased since it has been concentrated. Thus early in the work, 100 to 200 c.c. of the serum were given and immediate reactions oc-

TABLE I. ACUTE ENDOMETRITIS

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
A. S. C. 24 P. I	Precipitate labor (15 min.)	Fifth day fever	Acute endometritis	Sixth day 102° 120-24	11,500	G-Bacilli. Streptococci on smear	Sixth day P.P.* 100 c.c. of unconcentrated P.F.A.** intravenously. Chill, serum reaction	Afebrile four days after serum. Home ten days. i.e., seventeen days P.P.
A. R. W. 46 P. XIV	Prolapsed pulseless cord Craniotomy Uterus packed	Third day fever	Acute endometritis	Fifth day 102° 100-24	4,400	Streptococcus non-hemolyticus	Fifth day P.P. 40 c.c. of concentrated P.F.A. intravenously	Home fourteenth day P.P. Afebrile seventh day P.P. followed by moderate rises eighth and ninth days
F. M. C. 19 P. I	Eclampsia low forceps. Episiotomy with re-pair	Sixth day fever Headache	Acute endometritis	Tenth day 102° 120-22	26,300	Streptococcus hemolyticus	Tenth day P.P. 20 c.c. of conc. P.F.A. intravenously	Afebrile eleventh day P.P. Home thirteenth day release
M. Z. W. 39 P. IV	Incomplete abortion. Curettage. Uterine pack	Fifth day fever	Acute endometritis	Sixth day 102° 120-22	Not made	Streptococcus non-hemolyticus	Sixth day P.P. 40 c.c. of conc. P.F.A. intravenously	Afebrile seventh day P.P. Rise to 100° on ninth day P.P. only. Home twentieth day P.P.
O. D. C. 17 G. II	Spontaneous abortion	Third day severe pain in lower abdomen chill and fever	Acute endometritis Parametritis	Sixth day 103° 112-26	24,500	Streptococcus in broth outgrown on plate	Sixth day P.P. 40 c.c. of conc. P.F.A. intrav. Seventh day P.P. 40 c.c. of conc. P.F.A. intramuscularly	General condition good; septic course through fourteenth day P.P. Home twenty-first day P.P.

Note: In order to conserve space abbreviations are used where possible as:

*P.P. Postpartum.

**P.F.A. Puerperal fever antitoxin.

The same will hold for the other tables.

Blood cultures positive in only two patients (E. W. and M. D.).

TABLE I—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
B. B. C. 21 P. I	Preeclampsia Spontaneous	Third day fever Abdominal pains, vomited	Acute endometritis	Third day 104° 132-24	17,100	Strept. non-hem.	Third day P.P. 100 c.c. of goat serum intraven. Serum reaction vomited. Fourth day P.P. 40 c.c. of conc. P.F.A. intravenously	Afebrile seventh day P.P. Occasional fever. Home eighteenth day.
A. D. W. 18 P. I	Fundal cesarean section; labor, 24 hours	Second day fever	Acute endometritis Peritonitis	Fourth day 101° 98-22	14,500	Smears. Streptococci bacilli	Fourth day P.P. 40 c.c. of conc. P.F.A. intravenously	Afebrile twelfth day P.P. Home twentieth day P.P.
J. C. C. 18 P. I	Low forceps. Preeclampsia	Second day fever	Acute endometritis	Third day 101° 140-24	15,050	Strept. non-hem.	Third day P.P. 100 c.c. goat serum intrav. Fourth day P.P. 60 c.c. conc. P.F.A. intramuscularly	Afebrile eleventh day P.P. Home fourteenth day P.P.
B. H. W. 31 P. II	Labor 48 hours Classical cesarean section	First day fever and chill, headache	Acute endometritis Peritonitis	Fourth day 103° 132-36	21,700	Streptococcus on smear	Fourth day P.P. 40 c.c. P.F.A. intraven. Fifth day P.P. 20 c.c. P.F.A. intramus. Sixth day P.P. 20 c.c. P.F.A. intramus.	Afebrile tenth day P.P. Home fifteenth day P.P.
M. P. C. 26 P. IV	Spontaneous easy	Third day fever, severe pain in abdomen, headache	Acute endometritis	Fifth day 103° 124-24	19,000	Anaerobic. Strept. non-hem.	Fifth day P.P. 20 c.c. P.F.A. intraven., 20 c.c. P.F.A. intramus. Sixth day P.P. 40 c.c. P.F.A. intraven., 20 c.c. P.F.A. intramus. Seventh day P.P. 20 c.c. P.F.A. intramus.	Afebrile ninth day P.P. Home twelfth day P.P.

TABLE I—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
J. J. C. 20 P. I	Labor induced by cervical pack, labor 24 hr. Low cervical cesarean. B.O.W. rupt. ten hours	Second day fever	Acute endometritis Peritonitis	Fourth day 105 ⁴ . 124-44	6,000 Next day 12,900	Strept. non-hem.	Fourth day P.P. 20 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus. Fifth day P.P. 40 c.c. P.F.A. intramus. Sixth day P.P. 40 c.c. P.F.A. intramus. Seventh day P.P. 20 c.c. P.F.A. intramus. Serum reaction. (Urticaria.) Tenth day P.P.	Afebrile ninth day P.P. Home fifteenth day P.P.
F. O. C. 25 P. II	Induced abortion, catheter	First day chills, fever and sweats Pain in lower abdomen	Acute endometritis Peritonitis	Eighth day 105 ⁶ . 116-22	10,600	Strept. non-hem. Staph. albus. hem.	Eighth day P.P. 40 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus. Ninth day P.P. above repeated. Tenth and eleventh days P.P. 20 c.c. P.F.A. intramus.	Afebrile twenty-fifth day P.P. Home thirty-seventh day P.P.
C. J. C. 18 P. I	Low forceps Episiotomy	Second day fever	Acute endometritis	Fifth day 102 ⁶ . 104-24	14,500	Strept. non-hem. Staph. albus. hem. B. coli.	Fifth day P.P. 40 c.c. P.F.A. intramus. Sixth day P.P. 20 c.c. P.F.A. intramus.	Afebrile seventh day P.P. Home thirteenth day P.P.
T. W. W. 28 P. IV	Spontaneous abortion	Second day fever	Acute endometritis	Fourth day 104- 104-24	5,950	Strept. non-hem. Staph. albus.	Fourth day P.P. 40 c.c. P.F.A. intraven.	Afebrile fifth day P.P. Home twelfth day P.P.

TABLE I—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
F. G. C. 21 P. I	Bicornuate uterus. Transverse cervical cesarean. B.O.W. rupt. 10 hours Self-induced abortion. Douché-tip	First day fever	Gonorrheal, endocervicitis Acute endometritis	Fourth day 1032- 144 -28	14,700	Smear. Strept. Staph. Gonococci.	Fourth day P.P. 20 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus.	Afebrile eighth day P.P. Pulse 100. Home thirty-fifth day P.P.
C. R. W. 20 P. I.		First day fever, pain in lower abdomen	Acute endometritis	First day 105 - 148 -30	28,450	Not taken	First day P.P. 20 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus.	Afebrile second day P.P. Home eighth day P.P.
G. W. C. 15 P. I	Labor 33½ hr. High forceps Cervical and perineal lacerations, second degree	Second day fever, abdominal pain	Acute endometritis Peritonitis	Sixth day 105g. 160 -30	22,950	Strept. non-hem.	Sixth day P.P. 20 c.c. P.F.A. intraven.	Afebrile seventh day P.P. with occasional rise to 100. Home thirtieth day P.P.
E. W. W. 22 P. III	Labor 50 hours Spontaneous Home by M.D.	Second day Severe chills, fever	Acute endometritis, peritonitis, septicemia	Fourth day 1022- 144 -28	16,750	Strept. non-hem. Strept. non-hem. in blood	Fourth day P.P. 40 c.c. P.F.A. intravenously	Death 2½ hr. later. Serum death? Autopsy. Acute metritis. Salpingo-oophoritis. Pelvic peritonitis

TABLE I—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
M. D. C. 21 P. V	Spontaneous (Home by M.D.)	Fifth day fever	Acute endometritis Beginning parametritis Thrombophlebitis	Seventh day 104.4- 132-22	14,200	Strept. in broth. Overgrown on plate by contam. Strept. hem. in cervix	Seventh day P.P. 40 c.c. P.F.A. intramus. Eighth day P.P. 20 c.c. P.F.A. intramus. Serum reaction. Twenty-second day P.P.	Temporary thrombophlebitis right arm on twelfth day P.P. Afebrile eighteenth day P.P. Home twenty-eighth day P.P.
A. E. C. 27 P. V	Spontaneous	Second day fever	Acute endometritis	Sixth day 104.8- 116-24	13,306	Strept. hem.	Sixth day P.P. 40 c.c. P.F.A. intraven. Vomited 5 min. later. Serum reaction. Tenth day P.P.	Afebrile ninth day P.P. Home sixteenth day P.P.

TABLE II. ACUTE ENDOMETRITIS, PARAMETRITIS

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY	RESULT AND COMMENT
C. K. W. 19 P. I	Self-induced abortion (catheter)	Fifth day, chills, and fever	Acute endometritis, parametritis, peritonitis, septicemia	102-148-60 Twenty-sixth day	25,400	Streptococcus hemolyticus	Twenty-sixth day 50 c.c. of goat serum intraven. Twenty-eighth day 85 c.c. of goat serum intraven.	Death thirtieth day. Late case
R. D. C. 20 P. II	Spontaneous, easy (home by out-patient disp.)	Second day, pain in lower abdomen Fever and vaginal bleeding	Acute endometritis, parametritis, pelvic peritonitis, thrombophlebitis	104-108-24 Fifth day	15,750	Streptococcus hemolyticus	Ninth and eleventh days 100 c.c. of goat serum intraven. Reaction, chill, back-pain	Recovery, left pelvic mass. Swelling in left leg subsided. Home twenty-ninth day
M. A. W. 24 P. I	Spontaneous, easy (home by doctor)	Fifth day fever	Acute endometritis, parametritis, pelvic peritonitis	103-104-26 Seventh day	16,800	Streptococcus hemolyticus	Seventh and fifteenth days 20 c.c. P.F.A. intravenously	Released thirty-fourth day. Septic course, no complaints. Pelvic pathology
B. P. W. 23 P. I	15 hr. and 10 min. Low forceps Cervical laceration Episiotomy Preeclampsia	Seventh day fever B.P. 176-80	Preeclamptic toxemia Hypertension and album. Acute endometritis, parametritis and pelvic peritonitis Anemia	102-152-30 Fourth day	26,300	Streptococcus hemolyticus	Fourteenth day 100 c.c. goat serum intravenously	Death fifteenth day, eighteen hours after serum injection. Toxicemia and anemia

TABLE II—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY	RESULT AND COMMENT
L. J. W. 37 P. V	Self-induced abortion. (Slippery elm Ergoapiol Capsules)	Second day Pain in lower abdomen, chills, fever and vomiting	Acute endometritis, parametritis, and pelvic peritonitis	101.6- 140-32 Eighth day	19,900	Not taken	Eighth day P.F.A. 40 c.c. intraven. Ninth day repeated above. Eleventh, twelfth, thirteenth and fourteenth days 20 c.c. P.F.A. intramuscularly	Recovery afebrile after fifteenth day, pelvic path.
E. H. C. 22 P. I	Labor 78 hr. Dührssen's incisions, mid-forceps P.P. Hem. No cervical ring	Intrapartum and third day chill, fever, pain in lower abdomen	Acute endometritis, parametritis, finally localizing on right side	104.4- 120-20 Tenth day	19,400	Strept. hemolyticus. B. coli.	Tenth day 40 c.c. P.F.A. intramus. Twelfth day 40 c.c. intraven. Thirteenth day 40 c.c. P.F.A. intramus. Fourteenth day 20 c.c. intramus. Eighteenth day 20 c.c. intramus. Twentieth day 40 c.c. intramus.	Released twenty-fourth day. Feels fine. Right parametritis, P.M. fever
F. M. W. 37 P. II	Self-induced abortion	Seventh day Chills and fever, pain in lower abdomen	Acute endometritis, parametritis, pelvic peritonitis, becoming generalized	103.4- 120-26 Tenth day	19,200	B. coli. Streptococcus non-hemolyticus	Tenth day P.P. 20 c.c. P.F.A. intraven. Eleventh day 20 c.c. P.F.A. intramus. Twelfth day P.P. 40 c.c. P.F.A. intraven. Fifteenth day P.P. 20 c.c. P.F.A. intramuscularly	Septic course with bleeding. Curettage for bleeding. Twenty-first day P.P. Left parametritis. Twenty-seventh day P.P. afebrile. Psycho. hosp. Dementia precox

TABLE II—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY	RESULT AND COMMENT
M. S. C. 18 P. I	Self-induced abortion Pencil into vagina or cervix?	Seventh day Severe pain in lower abdomen Nausea and vomiting, chills and fever	Acute endometritis, parametritis, pelvic peritonitis, becoming generalized	101 - 124 -22 Fifteenth day	25,100	No growth	Fifteenth day P.P. 40 c.c. P.F.A. intrav., 40 c.c. intramus. Seventeenth day P.P. 20 c.c. P.F.A. intramus. Twentieth day P.P. 20 c.c. P.F.A. intramus.	Home twenty-ninth day P.P. Returned, operated ten weeks later. Right tubo-ovarian abscess, left salpingitis, pus-streptococcus hemolyticus
L. M. W. 18 P. I	Spontaneous easy (home by M.D.) B.O.W. rupt. by doctor	Second day, fever, chills, vomiting, soreness in lower abdomen	Acute endometritis, parametritis, pelvic peritonitis	103 - 130 -28 Fifth day	6,600	Streptococcus non-hemolyticus	Fifth day P.P. 40 c.c. P.F.A. intraven. Sixth day P.P. 40 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus. Seventh day 40 c.c. P.F.A. intramus. Eighth day 20 c.c. P.F.A. intramus. Eleventh day P.P. serum reaction	Home. Afebrile from sixteenth day P.P.
D. M. C. 23 P. I	Classic cesarean section Labor 19 1/2 hr.	Second day fever	Acute endometritis, parametritis, pelvic abscess, pelvic peritonitis	104s. 100 -22 Second day	20,500 15th day	Strept. on smear. B. coli cultured	Prophylactic 20 c.c. P.F.A. intramus. after operation. Second day P.P. 20 c.c. P.F.A. intramuscularly	High temp. and pulse unchanged. Sixteenth day P.P. post colpotomy. Home fifty-eighth day P.P.
O. F. C. 22 P. I	Induced abortion (curette three times)	Seventh day, fever, chills, bleeding	Acute endometritis, parametritis, extending pelvic peritonitis	103+. 120 -20 Eleventh day P.P.	17,850	Streptococcus hemolyticus. Staphylococcus hemolyticus	Eleventh day P.P. 40 c.c. P.F.A. intravenously	Home thirty-first day P.P. Afebrile from thirteenth day.

TABLE II—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY	RESULT AND COMMENT
M. L. C. 42 P. XIV	Bag induction Labor 36 hr. Purulent am- niotic fluid	Intrapartum	Acute endometritis, para- metritis, peritonitis, sep- ticemia	103 - 130 -20 Ninth day P.P.	17,950	B. coli. Streptococ- cus non- hem. Strep- tococcus hemolyticus and anaer- obic in blood	Ninth day P.P. 20 c.c. P.F.A. intrav. Tenth day P.P. 20 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus. Eleventh day 20 cc. P.F.A. intramus. Thirteenth day 20 c.c. P.F.A. intramus. Fif- teenth day P.P. P.F.A. intramus. Twenty-first day P.P. P.F.A. intra- muscularly.	Released twenty-fourth day P.P. Mild septic course
E. E. C. 23 P. II	Spontaneous abortion	Seventh day, chill and fever	Acute endometritis, para- metritis, septic broncho- pneumonia, septicemia	103+ 116 -24 Eighth day P.P.	18,200	Streptococ- cus non- hem.	Eighth day P.P. 40 c.c. P.F.A. intravenously. Twenty-sixth day P.P. x-ray, lung abscess, right upper, left lower lobe, thirty-ninth day P.P. Tubercle bacilli in sputum. Resolving in- farcts with M.A. pul- monary T.B.	Pulse down to 78, tem- perature 101°-103°
E. R. C. 30 P. VI	Spontaneous easy	Seventh day, bleeding, abdominal cramps, fever	Acute endometritis, para- metritis, pelvic perito- nitis	104+ 112 -36 Four- teenth day P.P.	18,400	Streptococ- cus non- hem. Staph. albus.	Fourteenth day P.P. 40 c.c. P.F.A. intramus.	Afebrile seventeenth day P.P. Occasional rise to 101°. Home. Seventeen days in hos- pital. Thirty-first day P.P.

TABLE II—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY	RESULT AND COMMENT
B. O. C. 30 P. VI	Expulsion of hydatid mole malignant sore throat	First day fever	Acute endometritis, parametritis, chlorioepithelioma, extension into parametrium with perforation into vagina	104 ⁺ . 136 -28 Second day P.P.	15,750	Streptococcus nonhem. Staph. albus	Second day P.P. 40 c.c. P.F.A. intramus. Twelve days later serum reaction	Eighth day P.P. hemorrhage. 4200 mg. radium. Temp. continued high, pulse low, transferred to another hospital for x-ray therapy. Too many factors for analysis
D. W. C. 21 P. III	Induced abortion (midwife)	Second day fever	Acute endometritis, parametritis, pelvic peritonitis, septicemia	105 ⁺ . 144 -36 Fourth day P.P.	10,150	B. coli. Staphylococcus albus. Few streptococcus nonhem.	Fourth day P.P. 40 c.c. P.F.A. intraven.	Septic course unabated. Died fifteenth day P.P. Coroner's autopsy, general septicemia
M. S. C. 24 P. III	Spontaneous abortion	First day P.P. chills, fever, vomited	Acute endometritis, parametritis, pelvic peritonitis, pyelitis	103 ⁺ . 120 -28 Eighth day P.P.	28,200	No growth	Eighth day P.P. 40 c.c. P.F.A. intraven.	Released tenth day P.P. Septic course unabated
M. M. C. 19 P. I	Cervical cesarean	Second day P.O. Fever, pain in lower abdomen	Acute endometritis, parametritis, pelvic peritonitis, pyelitis	101 ⁺ . 126 -24 Seventh day P.P.	11,500	Vagina B. coli.	Seventh day P.P. 80 c.c. goat serum intraven.	Afebrile twenty-fourth day P.P. Home, well

TABLE II—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY	RESULT AND COMMENT
A. P. W. 29 P. III	Induced abortion (medicine plus?)	First day P.P. bleeding from vagina Fever and chills Pain in lower abdomen	Acute endometritis, parametritis, septicemia	Thirty-fifth day P.P. 100° 128 -28	18,800		Thirty-fifth day P.P. 20 c.c. P.F.A. intraven.	Death thirty-sixth day P.P. Cardiac dilatation. Coroner's autopsy, general sepsis
R. G. W. 26 P. I	Induced abortion (catheter)	Sixth day P.P. fever, chills, pain in lower abdomen	Acute endometritis, parametritis	Ninth day 105 - 140 -22	9,200 marked anemia		Ninth day P.P. 40 c.c. P.F.A. intraven.	Blood transfusion followed by chill, restlessness, air-hunger, poor pulse. Death 6 hr. later

TABLE III. ACUTE PERITONITIS

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
P. D. W. 21 P. I	Induced abortion	First day pain in lower abdomen, vaginal bleeding	Acute metritis, generalized peritonitis, septicaemia	Sixth day	8,400	Strept. hem. Strept. hem. in blood	Sixth day P.P. 20 c.c. P.F.A. intraven. Seventh day P.P. 20 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus.	Death eighth day P.P. Coroner's autopsy, traumatic perforated uterus, acute peritonitis
J. L. W. 27 P. III	Spontaneous (home by midwife)	Third day pain in lower abdomen, chills and fever	Acute metritis, generalized peritonitis, right lower pleurisy	Ninth day 100s-140-56	11,100	Strept. non-hem.	Ninth day P.P. 110 c.c. goat serum, serum reaction	Death eleventh day P.P. Coroner's autopsy, generalized peritonitis
E. S. W. 32 P. I	Induced abortion	First day pain in lower abdomen, vomited	Acute endometritis, generalized peritonitis	Fifth day 102s-172-36	21,050	Anaerobic strept. non-hem.	Fifth day P.P. 50 c.c. P.F.A. intraven.	Death sixth day P.P. Coroner's autopsy, generalized purulent peritonitis
J. G. W. 39 P. IV	Spontaneous miscarriage, 6½ months	First day pain in lower abdomen, chills and fever, vomiting	Acute endometritis, generalized peritonitis	Sixth day 101s-104-24	13,550	Strept. hem.	Sixth day P.P. 40 c.c. P.F.A. intraven. Ninth day P.P. 40 c.c. P.F.A. intravenously	Death eleventh day P.P. Generalized peritonitis
G. G. C. 15 P. I	Spontaneous, perineal laceration, second degree	Third day pain in lower abdomen. Toxic	Acute parametritis, peritonitis	Eighth day 103-132-38	5,750	Strept. hem. postmortem strept. hem. in blood	Eighth day P.P. 40 c.c. P.F.A. intra. Ninth day P.P. 40 c.c. P.F.A. intramus. Tenth day P.P. 40 c.c. P.F.A. intramus. Eleventh day P.P. 20 c.c. P.F.A. intramus.	Death twelfth day P.P. Autopsy, generalized serous fibrinous peritonitis

Blood cultures positive in three patients. (P. D., G. G., B. G.)

TABLE III—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
M. M. W. 42 P. X	Spontaneous, easy, P.P. hem. (home by mid-wife)	Third day P.P. pain in abdomen and vomiting	Acute endometritis, generalized peritonitis	Fifth day 104.4-160-52	8,000	Streptococcus non-hem.	Fifth day P.P. 40 c.c. P.F.A. intraven.	Death sixth day P.P. Virulent generalized peritonitis. No autopsy
F. S. W. 22 P. III	Induced abortion (by M.D.)	First day P.P. severe pain in lower abdomen, vaginal bleeding, fever	Acute metritis, generalized peritonitis	Fourth day 103.6-160-36	25,400		Ninth day P.P. 40 c.c. P.F.A. intraven. Tenth day P.P. 20 c.c. P.F.A. intraven., 30 c.c. P.F.A. intramus.	Death eleventh day P.P. Coroner's autopsy, acute purulent peritonitis
B. H. C. 16 P. I	Spontaneous abortion followed by curettage (home by M.D.)	Fourth day P.P. pain in lower abdomen, fever	Acute metritis, parametritis, peritonitis, pneumonia	Fifteenth day 101.4-120-36	22,750	Strept. hem.	Fifteenth day P.P. 40 c.c. P.F.A. intraven., 20 c.c. P.F.A. intramus.	Death seventeenth day P.P. Coroner's autopsy, general sepsis
V. L. W. 33 P. I	Induced abortion (slippery elm) 12 previous induced abortions	Fifth day P.P. pain in lower abdomen, chills, and fever	Acute metritis, generalized peritonitis	Thirteenth day 101-138-26	16,950	Strept. non-hem.	Thirteenth day P.P. 40 c.c. P.F.A. intramus. Fourteenth day P.P. 20 c.c. P.F.A. intramus.	Fever subsided for three days, then recurred for six days, then subsided. Home thirty-fifth day P.P.
B. G. C. 22 P. I	Spontaneous (home by mid-wife)	Fourth day P.P. pain in abdomen, distension, fever, slight nausea	Acute metritis, generalized peritonitis	Ninth day 104.2-160-42	31,250	Strept. non-hem. Post-mortem. Strept. non-hem. in blood	Ninth day P.P. 40 c.c. P.F.A. intraven. Tenth day P.P. 40 c.c. P.F.A. intramuscularly	Death eleventh day P.P. Autopsy, purulent phlebitis of uterus, diffuse fibro-purulent peritonitis

TABLE IV. ACUTE PARAMETRITIS, THROMBOPHLEBITIS

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
A. B. W. 18 P. I	Classic cesarean section	Sixth day P.P. fever and chills	Acute endometritis, parametritis, peritonitis, thrombophlebitis of pelvic veins and left brachial vein	Twenty-sixth day 105 ⁴ . 146-32	76,000	Strept. on smear, outgrown by B. coli. on plate	Twenty-sixth day P.P. uncon.* intrav. Twenty-eighth day P.P. 100 c.c. P.F.A. uncon. intrav.	Fever lower twenty-eighth to thirty-second day P.P. High fever from thirty-third to fifty-eighth day P.P. Home seventieth day.
G. D. W. 23 P. I	Preeclampsia, low forceps, episiotomy	Second day P.P. fever, pain in lower abdomen	Acute endometritis, parametritis, pelvic thrombophlebitis	Third day 104 ² . 124-26	18,400	Strept. hem.	Third day P.P. 60 c.c. P.F.A. intramus. Fourth day P.P. 40 c.c. intramus. Twelfth day P.P. serum reaction. Seventeenth day P.P. desensitized, 40 c.c. P.F.A. intramus.	Afebrile sixth day P.P. Swelling left leg with tenderness along femoral vein, twenty-second day P.P. to twenty-sixth day P.P. Home thirty-seventh day P.P.
E. F. C. 32 P. II	Spontaneous abortion (?)	Second day P.P. chills, fever, vaginal bleeding	Acute endometritis, parametritis, pelvic thrombophlebitis, polyarthritides, septicemia	Fourth day 104 ² . 124-40	12,000		Fourth day P.P. 40 c.c. P.F.A. intramus.	Septic course unabated. Death eleventh day P.P. No autopsy

*Unconcentrated.

TABLE V. ACUTE PARAMETritis WITH PULMONARY COMPLICATIONS

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
I. D. W. 38 P. V	Spontaneous abortion, manual removal of placenta Prolapsus uteri	Second day P.P. fever	Acute endometritis, parametritis, pulmonary embolus, infarct with abscess	Fourth day 103 ^a . 116 -26	17,500	Strept. non-hem. Spilli on smear spuntum, pneumococci.	Fourth day P.P. 20 c.c. P.F.A. intramus. Thirteenth day P.P. 20 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus.	Septic course unchecked until fourteenth day. Home thirty-second day P.P.
M. J. C. 16 P. I	Bag induction Prolapsed cord Episiotomy	First day P.P. pain in lower abdomen, fever, chill on third day	Acute endometritis, parametritis, pulmonary embolus, infarct with abscess and empyema	Third day 103 ^a . 140 -24	20,750	Strept. non-hem. Spilli and B. fusiformis on smear	Third day P.P. 40 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus.	Fourth day P.P. general condition improved. Sudden pain in right side of chest. Infarct present. X-ray empyema. Thoracotomy with needle. 75 c.c. foul, grayish-green pus. Strept. nonhem. in culture. Home forty-second day P.P.
L. B. C. 20 P. I	Spontaneous, labor 50 hr., 20 minutes	Fifth day P.P. Fever, pain lower abdomen	Acute endometritis, parametritis, septic embolus, marked infarction. (After rectal examination)	Eleventh day 101 ^a . 132 -24	16,400	Strept. non-hem. B. coli.	Eleventh day P.P. 40 c.c. P.F.A. intraven.	Death thirteenth day P.P. Septicemia, pulmonary infarction. No autopsy
J. M. C. 38 P. IV	Miscarriage 5 months Manual removal of placenta	First day P.P. Fever, pain in lower abdomen	Acute gangrenous endometritis, parametritis, bronchopneumonia	Third day 103 - 132 -32	22,000	Strept. non-hem.	Third day P.P. 20 c.c. P.F.A. intrav., 20 c.c. P.F.A. intramus.	Death tenth day P.P. Autopsy, ulcerative gangrenous metritis, purulent parametritis. Multiple septic infarcts of both lungs and multiple acute abscess of both lungs.

TABLE VI. EXTRAPELVIC PUERPERAL CONDITION

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	SERUM-THERAPY PUERPERAL FEVER ANTITOXIN	RESULT AND COMMENT
A. T. C. 24 P. I	Spontaneous, (home by M.D.)	Third day P.P. abdominal pains, fever	Acute endometritis. Probable generalized miliary tuberculosis	Eight- eenth 102 - 128 -28	4,600	Strept. viri- dans	Eighteenth day P.P. 100 c.c. goat serum intra- venously	Septic course un- changed. Released twentieth day P.P. Died twenty-third day P.P. at home. No au- topsy.
A. F. W. 36 P. III	Self-induced abortion 2½ months	First day P.P. chills, fever, pains in chest and abdo- men	Acute endometritis, sep- tic bronchopneumonia, septicemia	Third day 104 - 120 -40	38,800	Pneumococci	Third day P.P. 40 c.c. P.F.A. intraven. Fourth day P.P. 40 c.c. P.F.A. intramus.	Death seventh day P.P. Coroner's autopsy, right lobar pneumonia

TABLE VII. CONTROLS

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	GENERAL THERAPY NO ANTITOXIC SERUM	RESULT AND COMMENT
G. M. C. 22 P. I	Version and extraction	First day P.P. Pain in lower abdomen Fever	Acute endometritis, metritis, septicaemia, healing ischio-rectal abscess, opened 13 days before delivery	First day 102°-120 -28	28,000	Strept. viridans Pneumococci	Sixth day P.P. 30 c.c., 1% mercurochrome intravenously. Eighth day P.P. repeated. Tenth day P.P. repeated.	Some improvement after third injection. Arthritis of left elbow and cutaneous abscess in right buttock. Both yielded Strept. hem. Recovery—91 days in hospital. Ankylosis of left elbow
P. H. C. 24 P. IV	Waiting mother in hospital Spont. 2 hr. labor	Second day P.P. Fever, abdominal pain, emesis	Acute endometritis, metritis, septicaemia	Second day 101°-120 -24	4,200	Strept. hem. also in blood	Second day P.P. 30 c.c., 1% gentian violet intravenously	Died on the sixth day P.P.
H. B. W. 23 P. II	Spontaneous at home (by M.D.)	First day P.P. Fever	Acute endometritis, metritis, beginning peritonitis, septicaemia	Fifth day 104 -142 -48	22,500	Strept. hem.	Fourth day P.P. 20 c.c. commercial antistrept. serum given by doctor at home.	Died on the seventh day P.P. Autopsy, generalized serofibrinous purulent peritonitis. Focal bronchopneumonia and focal necrosis of liver
M. B. C. 28 P. VIII	Spontaneous abortion 3 mon. at home	First day P.P. Pain in lower abdomen, slight vaginal bleeding	Acute endometritis, metritis, beginning peritonitis	First day 100 -110 -22		Strept. non-hem.	General measures	Died on fifth day P.P. Coroner's autopsy, acute purulent peritonitis

TABLE VII—Cont'd

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	GENERAL THERAPY NO ANTITOXIC SERUM	RESULT AND COMMENT
R. G. W. 24 P. VI	Precipitate delivery	Second day P.P. headache, chills, and fever	Acute endometritis, metritis	Second day 103 - 96 - 20	11,750	Strept. hem.	General measures on fifth day	Puerperal fever for two months after first child. Fever subsided P.P. Recovery
M. L. W. 31 P. III	Spontaneous (home by M.D.)	Ninth day P.P. chills, fever Vomited for 2 days Suprapubic pain	Acute metritis, pelvic peritonitis, septicemia	Fifth day 100 - 122 - 30		Strept. non-hem. in blood	Stimulants	Died on eighteenth day P.P. Chronic nephritis also present
M. I. a. W. 40 P. VIII	Spontaneous abortion at home, 4 months pregnant	First day fever, vaginal bleeding	Acute endometritis, secondary anemia	Fifth day 101 - 120 - 24		Strept. hem. Staph. albus. B. coli.	Stimulants. Blood transfusion, curettage	Recovery, home twelfth day P.P. Returned thirty-eight days later because of vaginal bleeding, curettage, home five days later
M. B. W. 23 P. I	Self-induced abortion, (slippery elm)	Second day P.P. Pain in lower abdomen, chills, fever, vomiting and vaginal bleeding	Acute metritis, pelvic peritonitis, septicemia	Fourth day 103 - 152 - 36		Strept. hem. in blood	General measures	Died ninth day P.P. Coroner's autopsy, acute purulent peritonitis

TABLE VII—CONT'D

PATIENT	CHARACTER OF DELIVERY	ONSET OF PUERPERAL FEVER	CLINICOPATHOLOGIC DIAGNOSIS	T.P.R. DAY P.P.	BLOOD COUNT	BACTERIOLOGY CERVIX	GENERAL THERAPY NO ANTITOXIC SERUM	RESULT AND COMMENT
A. B. C. 40 P. VI	Spontaneous abortion (home)	First day chills, fever, cough	Acute metritis, parametritis, pelvic peritonitis No pulmonary path. Arthritis of right ankle Sixth day P.P. Septicemia	Fourth day 102 - 112 -26		Strept. hem. in blood	Fifty-fifth day P.P. incision and drainage of right ankle	Recovery, ankylosis of right ankle. Home one hundred and thirty-fifth day P.P.
A. B. W. 28 P. I	Spontaneous (home by M.D.)	Seventh day P.P. Pain in left lower abdomen, chills, fever and cough	Acute endometritis, pelvic peritonitis, becoming diffuse Bronchopneumonia Septicemia	Twenty-sixth day 1012- 148 -40	28,600	Strept. hem. also in blood	Twenty-fifth day P.P. 20 c.c., 1% mercurochrome intravenously. Leucocyte extract intramuscularly	Died thirty-fifth day P.P. No autopsy
B. C. W. 30 P. III	Spontaneous (home by midwife)	Sixth day P.P. Chills, fever	Acute metritis, parametritis, septicemia, arthritis of left hip joint	Ninth day 102 - 144 -32	5,500	Strept. hem. also in blood	General measures	Died thirteenth day P.P. No autopsy
C. L. C. 20 P. II	Spontaneous 11° 20'	Third day abdominal pain, fever	Acute metritis, parametritis, pelvic peritonitis	Fourth day 1024. 132 -28	23,100	Gram-positive strept. on smear	General measures. Twenty c.c. commercial anti-strept. serum intramuscularly on eighth day P.P.	Condition not improved after serum. Fever subsided on twenty-first day P.P., recovery
C. K. W. 38 P. VI	Induced abortion (home, vaginal pack)	First day P.P. Fever, pain in lower abdomen	Acute metritis, parametritis, pelvic peritonitis, septicemia	First day 101 - 124 -22	11,400	Strept. hem. in blood	Sixth day P.P. 12 c.c. milk intramuscularly. Ninth day P.P. 30 c.c., 1% mercurochrome intravenously. Eleventh day P.P. 30 c.c., 1% mercurochrome intravenously	Septic course unchanged by mercurochrome. Developed bronchopneumonia. Died twentieth day P.P.

curred in 30 per cent of the cases while with the concentrated serum only about 5 per cent of the cases show serum sickness in three to seven or even twelve days after the injection. In the beginning of this study, the dose necessary to overcome the toxemia was unknown and amounts varying from 20 c.c. to 160 c.c. (in divided doses over several days)

TABLE VIII. COMPARISON OF MORTALITIES IN PUERPERAL FEVER

	NUMBER OF PATIENTS		SERUM-THERAPY	CONTROL (NO SERUM)
Fitzgibbon and Bigger	57			51%
Bailey	13		15.3%	
Warnekros et al	200		0.0%	
Gaessler	400		5.0%	
British	104	Other measures	72.0%	
Congress report	47		76.5%	
Krongold-Vinover	46		13.0%	
Lash	20	Endometritis	5.0%	
	20	Parametritis	25.0%	
	10	Peritonitis	90.0%	
	57	All stages	32.0%	
	13			61%

were given. However, it has been determined from clinical experience that 40 c.c. of the concentrated serum is an adequate initial dose, which can be repeated in this or half of this amount on successive days if fever and toxemia persist. In the presence of a marked toxemia, large doses of antitoxin are indicated, and should be introduced cautiously by the most direct route, that is, intravenously. The antitoxic serum in most instances regardless of the extent of the pathology overcame the toxemia, leaving the patient feeling well. In the presence of uncomplicated endometritis the fever as a rule also subsided but where a more advanced stage of the infection occurred, the temperature tended to remain unaltered. This observation would seem to confirm the theory that streptococcus antitoxic sera neutralize the toxins and aggrassinins of the bacteria, thereby allowing the leucocytes to render the organisms innocuous.

An analysis of the cases described in the tables shows that in the series of 20 endometritis cases, there was a mortality of 5 per cent. As the patient died two and one-half hours after the injection of the antitoxin the question arose as to whether the result could be ascribed to a reaction due to the serum or to an overwhelming infection. The large number of streptococci and the defense reaction of the tissue can be seen in Fig. 4, and the temperature curve in Fig. 1 b. Of the 20 women having parametritis with acute endometritis, 5 died, giving a mortality of 25 per cent. Patient C. K., who received the antitoxic goat serum on the twenty-sixth day postpartum, when irreparable damage had already been done, can hardly be considered a true test case. Anemia

resulting from delivery and later venesection for hypertension contributed to the death of patient B. P. In patient D. M. the bacillus colon was the predominant organism which was also isolated from the pus of the pelvic abscess. Although serotherapy was started early (fourth day postpartum) in the course of the infection of patient D. W., it was ineffective presumably because the predominating bac-

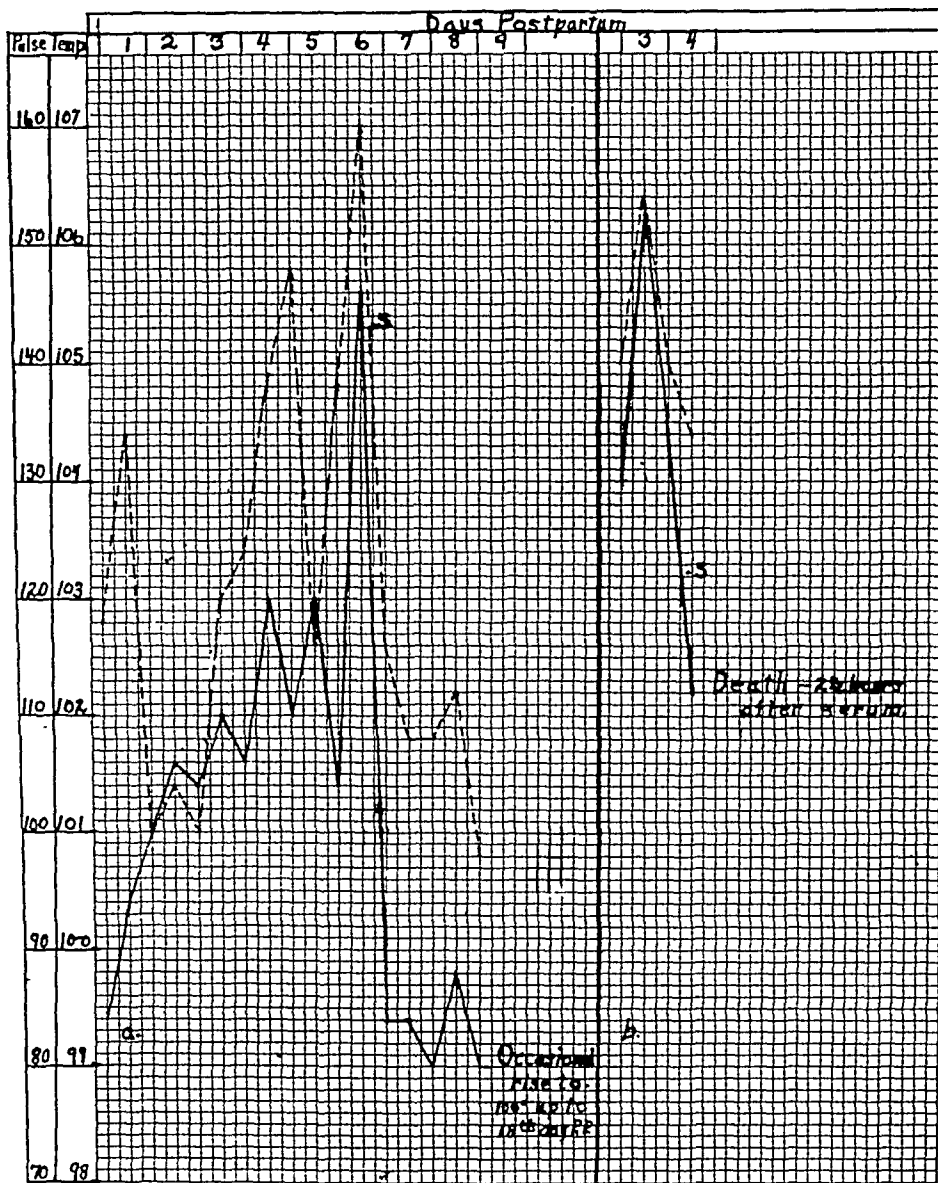


Fig. 1.—Puerperal fever: Acute endometritis septicemia. (Solid line, temperature; broken line, pulse.)

a. G. W. (See Table I.) S, 20 c.c. Puerperal fever streptococcus antitoxin intravenously.

b. E. W. (See Table I.) S, 40 c.c. Puerperal fever streptococcus antitoxin intravenously.

teria were *Bacillus colon* and *Staphylococcus albus*. The probable incompatibility of the blood used in the transfusion of patient R. G. played a rôle in causing her death. Fig. 2 illustrates the temperature and pulse curves of two patients with parametritis after serotherapy.

In the generalized or diffuse peritonitis, 9 of the 10 patients died, giving a mortality of 90 per cent. The surviving patient had a beginning diffuse peritonitis although she was very sick when admitted to the hospital. One of the 3 patients with thrombophlebitis and 2 of the 4 with pulmonary pathology secondary to that of the pelvis died. The degree of morbidity following antitoxin administration depended on the presence or absence of other bacteria besides the streptococcus and upon the extent of the pathology. It is quite evident that the serum does not influence directly the damage already done. From the percentages quoted, although not obtained from a large series of cases,

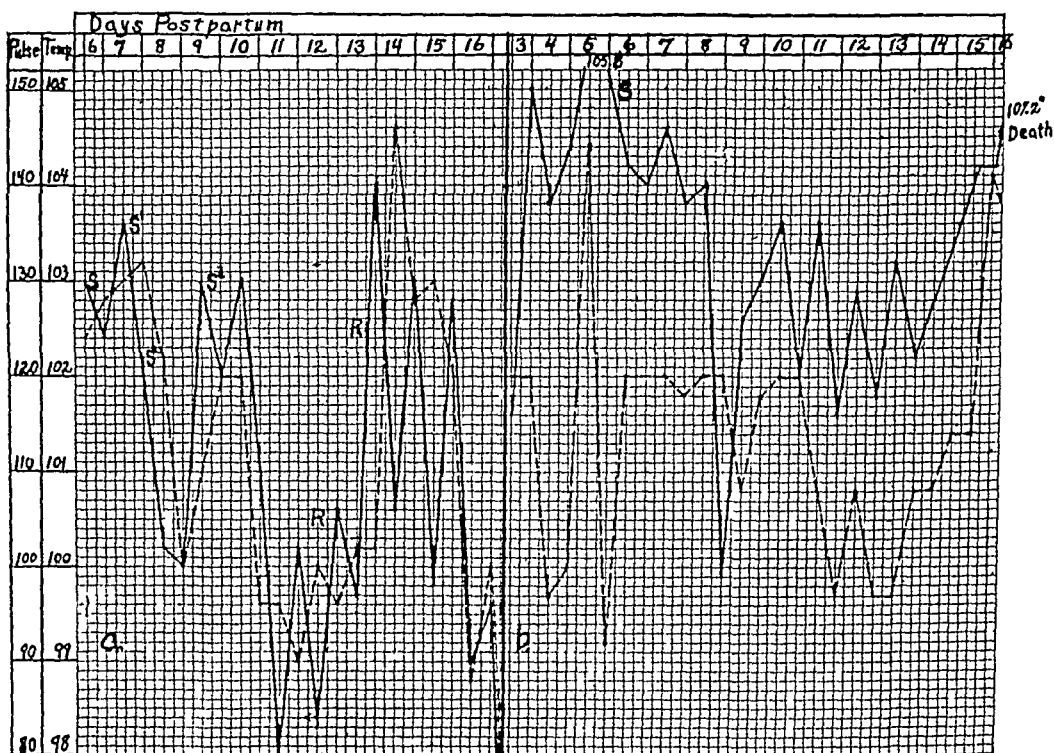


Fig. 2.—Puerperal fever: Acute parametritis septicemia. (Solid line, temperature; broken line, pulse.)

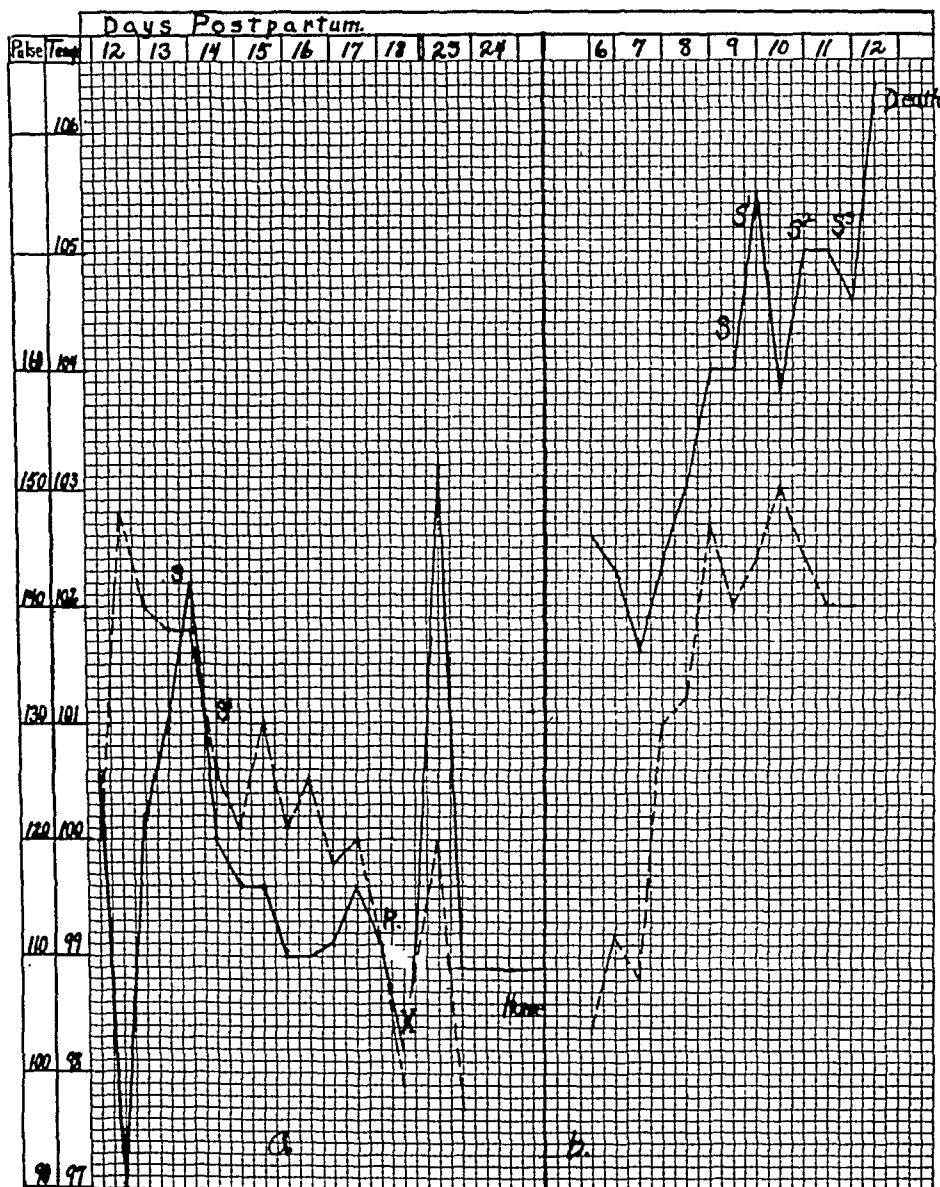
a. L. M. (See Table II.) *S*, 40 c.c. Puerperal fever streptococcus antitoxin intravenously. *S*¹, 40 c.c. Puerperal fever streptococcus antitoxin intravenously. 20 c.c. Puerperal fever streptococcus antitoxin intramuscularly. *S*², 40 c.c. Puerperal fever streptococcus antitoxin intramuscularly. *S*³, 20 c.c. Puerperal fever streptococcus antitoxin intramuscularly. *R*, Onset of serum sickness, i.e. generalized urticaria and fever.

b. D. W. (See Table II.) *S*, 40 c.c. Puerperal fever, streptococcus antitoxin intravenously.

there is a definite impression that the antitoxin shows a definite value in the early cases of puerperal fever, that is, acute endometritis, less, when parametritis occurs, little or no value in diffuse peritonitis. The mortality of the whole group of patients (57) was 32 per cent.

In considering the control group of patients for comparison, the mortality was 61 per cent. Although all the patients had an endometritis before developing the more advanced stages, only 7 were ob-

served in the hospital. Of these, 3 died, giving a 43 per cent mortality. Four patients with generalized peritonitis died (100 per cent mortality). One of the 2, having a parametritis and septicopyemia died (50 per cent mortality).



streptococcus was present in 32 instances with a mortality of 47 per cent; the nonhemolytic streptococcus in 8 with a mortality of 50 per cent. One patient with an anaerobic streptococcus died (100 per cent

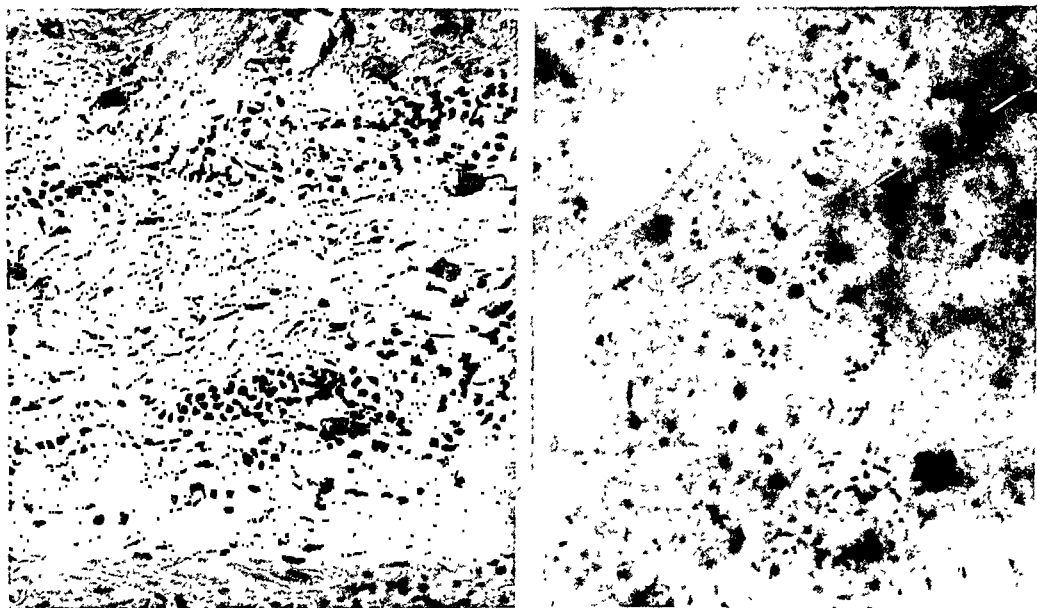


Fig. 4.—Photomicrograph from patient, E. W., illustrating the acute metritis (defense reaction) and the generalized invasion of streptococci.

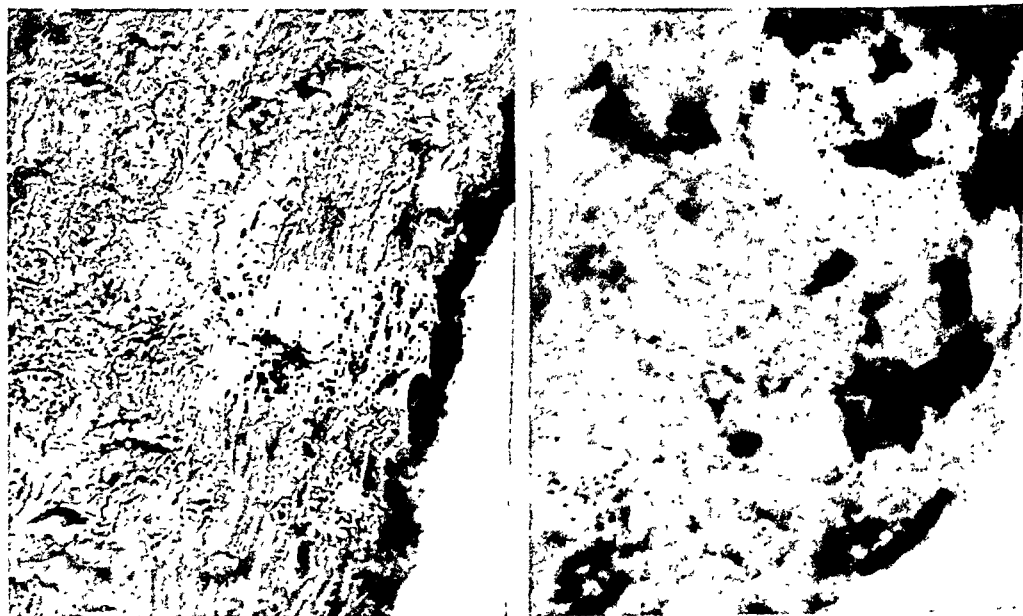


Fig. 5.—Photomicrograph from patient, G.G. (peritonitis), illustrating the poor defense mechanism in the uterus and the marked invasion of the subperitoneal space by the streptococci.

mortality). One of 6 patients with unclassified streptococci died (17 per cent mortality), and 2 of 3, in whom gram-positive cocci were seen on smear only, died (67 per cent mortality).



Fig. 6.—Photomicrograph from patient, B. G. (peritonitis-septicopyemia), illustrating the purulent phlebitis of the myometrium and phagocytosis of the streptococci.

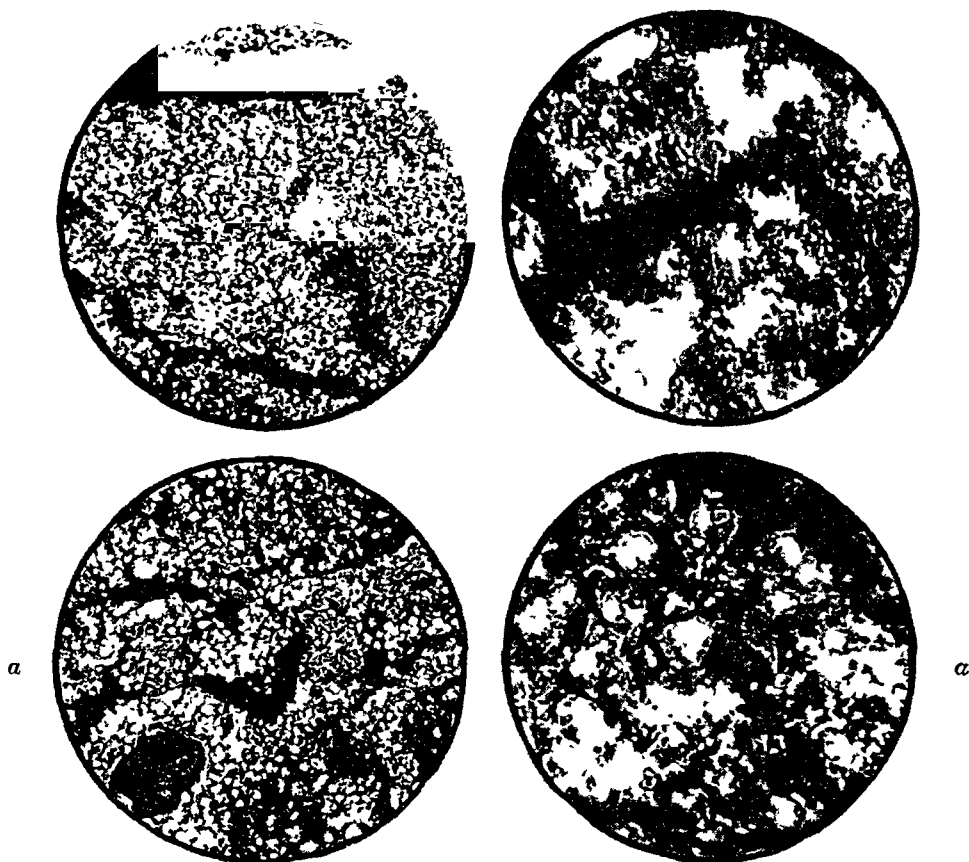


Fig. 7.—Photomicrograph from patient, J. M. (gangrenous purulent metritis), illustrating one of the many abscesses of the myometrium and the generalized streptococcal invasion and the associated bacteria. B. colon and *Staphylococcus albus* found in culture. a, From one of the abscesses of the lung, showing the presence of streptococci.

CONCLUSIONS AND COMMENT

The therapeutic value of an antitoxic serum is dependent on its specificity, potency and lack of serum reactions. The puerperal fever streptococcus antitoxin possesses specific value in acute endometritis with septicemia due to the hemolytic streptococcus. There is also a favorable response in the nonhemolytic streptococcus infections. Its potency as determined by toxin neutralization (Dick method) and by comparison with that of scarlet fever antitoxin of known therapeutic value shows a titer equal to that of the scarlet fever antitoxin. The antitoxic power increases with further immunization of the animals.

1. Small doses of the concentrated antitoxin achieving favorable clinical therapeutic results without immediate reactions is evidence of a specific rather than a nonspecific action.

2. Further evidence of the therapeutic specificity is adduced by the fact that with the increasing potency of the serum, correspondingly smaller doses were used with equivalent results.

3. The larger amounts of serum used in the earlier work were probably superfluous as the only index then used for the repetition of the dose was fever, rather than the condition of the patient.

4. To use fever as an only guide for serum-therapy may be misleading, since the antitoxin may overcome the toxemia and thereby allow the leucocytes to overcome the streptococci, without causing an immediate drop in fever.

5. In spite of the hyperpyrexia the general improvement of the patient influences the defense mechanism favorably permitting thereby the localization of the infection to the pelvis.

6. Immediate reactions are uncommon with the concentrated antitoxin and serum sickness occurs only when large doses have been used which are necessary at times. The serum sickness can be controlled by drugs.

7. In addition, the antitoxin is not harmful, having no irritating effect as no symptoms arose, indicating any disturbance of the kidney or other parenchymatous organ.

8. Since this antitoxin is comparable in its efficacy in the treatment of puerperal fever to diphtheria, scarlet fever or tetanus antitoxin, a woman developing symptoms of puerperal fever should receive it within thirty-six to forty-eight hours after the onset. Just as antitoxin is of little, if of any, value in far advanced diphtheria, tetanus, in sinusitis or peritonitis, in scarlet fever, so with advanced puerperal fever the administration of antitoxic serum is practically valueless.

9. Since severe and even fatal cases may appear mild at the onset and since heretofore there has been a tendency to withhold the anti-

toxin until it is apparent that the prognosis is unfavorable, it is well to give the antitoxin in all early cases.

10. The comparison of mortalities in the group of patients receiving antitoxin (32 per cent) and the control groups (Lash, 61 per cent, Fitzgibbon and Biggèr, 51 per cent), shows evidence of therapeutic value of the puerperal fever streptococcus antitoxin.

REFERENCES

- (1) *Aronson*: quoted by Koehler and Ehrenfest; *Therapy of Puerperal Fever*, St. Louis, C. V. Mosby Company, 1925, p. 224-227. (2) *Bailey, H.*: *The Serum Treatment of Puerperal Sepsis*, AM. J. OBST. & GYN. 7: 658, 1924. (3) *Bar, and Tissier*: *L'Obstetrique*, 1896, 1, 97. (4) *Eichel, O. R.*: *A Preliminary Report of a Statistical Study of Puerperal Sepsis*, AM. J. OBST. & GYN. 7: 667, 1924. (5) *Fitzgibbon, G., and Bigger, J. W.*: *A Clinical and Bacteriologic Investigation of Puerperal Fever*, Rotunda Hospital, Dublin, J. Obst. & Gynec. Brit. Emp. 32: 298, 1925. (6) *Gaessler, E.*: *Serum Therapy of Puerperal Septic Infections*, München. med. Wehnschr. 75: 164, 1928. (7) *Krongold-Vinaver*: *Bull. de le d'obst. et de gynec. de Paris* 10: No. 2, 1921. (8) *Lash, A. F., and Kaplan, B.*: *Puerperal Fever: Streptococcus Hemolyticus Toxin*, J. A. M. A. 84: 1891, June 27, 1925. (9) *Lash, A. F., and Kaplan, B.*: *Puerperal Fever; Streptococcus Hemolyticus Toxin and Antitoxin*, J. A. M. A. 86: 1197, April 17, 1926. (10) *Marmorek*: *Ann. de l'Inst. Pasteur* 9: 593, 1895. (11) *Mayrhofer*: *Zur Frage nach Aetiologie der Puerperal Processe*, Monatschr. f. Geburtsh. 25: 112-134, 1865. (12) *Meyer, and Ruppeld*: *Med. Klin.* 1192, 1907. (13) *Neufeld and Rimpau*: *Ztschr. f. Hyg.* 51: 283, 1905. (14) *Novak, E.*: *J. A. M. A.* 36: 189, Jan. 16, 1926. (15) *Park*: Quoted by Bailey. (16) *Pasteur*: *Septicemie puerperale*, *Bull. Acad. de méd.* p. 260, 1879. (17) *Report of Fifth British Congress of Obstetrics and Gynecology*, J. Obst. & Gynec. Brit. Emp. 32: 235, 1925. (18) *Van de Velde, and Pelham*: *Arch. f. Gynäk.* 23: 1, 1904. (19) *Warnekros, Louros, and Becker*: *Serotherapy of Puerperal Sepsis*, München. med. Wehnschr. 73: 2155, 1926. (20) *Meissl*: *Wien. klin. Wehnschr.* No. 1, 1909.

(For discussion, see page 424.)

Mayer, A.: *Untimely Rupture of the Membranes*, *Monatsschrift für Geburtshilfe und Gynäkologie*, 1927, lxxvii, 307.

Since the war there has been an increased incidence of premature rupture of the membranes, especially in elderly primiparas. Mayer has observed that not only is this true but also the fact that frequently many days elapse between the rupture of the bag of waters and the onset of labor pains. He believes the cause of the premature rupture to be an abnormal friability of the membranes the etiology of which is unknown. Microscopic examination revealed no abnormalities. It is just as difficult to explain the long interval before the pains begin. Patients should be informed of this occurrence and advised to enter a hospital to avoid complications. Nothing is done or at most an attempt is made to start labor medicinally or thermically. No complications were noted in the author's cases either during labor or the puerperium and infection which was previously feared if one waited too long after rupture of the membranes seldom occurred. In the cases where infection did occur no attempt was made to terminate labor and excellent results were obtained by waiting. In cases of delayed rupture of the membranes the author noted that the fetal heart tones became less distinct and slower in rate and he believes that the persistence of the bag of waters produces cerebral compression with stimulation of the vagus.

J. P. GREENHILL.

EXPERIMENTAL ENDOMETRIOSIS*†

By SYDNEY S. SCHUCHET, M.D., F.A.C.S., CHICAGO, ILL.

(Adjunct Gynecologist, Michael Reese Hospital; Associate Professor in Gynecology,
Post Graduate Hospital)

INTRODUCTION

THE uncertainty surrounding the origin of endometriomas has given rise to a great deal of discussion. There is perhaps no subject in the whole field of gynecology concerning which more divergence of opinion has been expressed than that of heterotopic or misplaced endometrial tissue.

Our knowledge of endometrial proliferation dates back to 1860 when von Rokitansky¹ first described adenomyomas as pathologic entities. This important contribution was lost sight of for more than thirty years and it was only after von Recklinghausen^{2, 3, 4} published the results of his studies in 1893, 1895, and 1896 that interest was revived. In 1895 von Recklinghausen published his famous Wolfian theory in an attempt to explain the etiology of adenomyoma. Among the earlier workers are Chiari,⁵ Martin,⁶ and Orthman. From the terms given this condition, namely, adenomyosalpingitis, adenomyositis tubae, and salpingitis isthmica nodosa, it is apparent that they were interpreted as basic inflammatory processes.

Chiari⁵ in 1887 described a nodular swelling of the Fallopian tubes which he called salpingitis isthmica nodosa, a condition now known as adenomyoma of the tubes.

Cullen,⁷⁻¹⁵ the outstanding American authority on adenomyoma, began the study of this subject contemporaneously with von Recklinghausen, and from the very outset up to the present time he has maintained unswervingly that all adenomyomata arise from müllerian rests or directly from the uterine mucosa.

In 1897 Pick¹⁶ described the cell arrangement of these organoid tumors as identical with those present in the mesonephros or pronephros but later showed an inclination to the dual genesis, namely the Wolfian body and duct.

Robert Meyer¹⁷ in 1897 ascribed the origin of the cornual tumors to the Wolfian body. In 1903 he^{18, 19} still championed the von Recklinghausen theory and stated, "It is true that the normal tubal mucosa has no glands, but the pathologic tube is different, it can produce them." In 1909 Meyer²⁰ propounded an additional histogenesis, namely the intestinal mucosa (hypoblastic origin), but later withdrew in favor of the serosal theory and also declared the Wolfian body theory to be "a myth that is dying very slowly."

Iwanoff²² in 1898 regarded the subserosal adenomyoma of the uterus as a transformation of peritoneum into the gland structure. He is supported in this view by Aschoff and L. Pick.

Robert Meyer²¹ is now the most ardent defender of the serosal theory and goes so far as to say that celomic epithelium is of such quality that it can produce endometrial tissue in spite of the fact that endometriomas have never been found in the pleural or pericardial cavity. More recently he describes heteroplasia on the basis of congenital predisposition and dependent on ovarian activity or other stimulating influences. He considers this a sufficient explanation for endometriomas

*Read at a meeting of the New York Obstetrical Society, October 9, 1928.

†This work has been conducted under a grant from the Douglas Smith Foundation for Medical Research in the University of Chicago.

being found in the tube. Exception is taken with Halban's theory of lymphatic permeation on the basis that elastic tissue is not present in the uterine mucosa but is present in ectopic endometrioma-like tissue, and therefore the latter could not have originated from the endometrium. It should be borne in mind that contrary to this view, Lochrane has found elastic fibers present in normal uterine curettements. And what is more difficult of explanation is the correct interpretation of endometrial glands in lymph nodes reported by Emil Ries,²⁴ Wertheim and Wulfing.²⁵

This theory is in direct conflict with Cullen's explanation of uterine adenomyomata which he has proved conclusively arises by direct extension of the uterine mucosa.

We also note that Russell in 1899 reported a case of adenomyoma of the ovary and considered this as an anomalous point of development of a portion of müllerian duct in the germinal epithelium.

In 1918 Lockyer²⁶ published his work on "Fibroids and Allied Tumors" with an extensive review of the literature of adenomyomata up to that year. He was a fervent adherent of the mesonephric teachings and considered Kossmann's²⁷ work on müllerian origin of these tumors as destructive criticism, in spite of the fact that the opinions of Kossmann and Cullen are supported by Baldy and Longscope,²⁸ Opitz,²⁹ Gottschalk,³⁰ Klages³¹ and Lockstaedt.³²

Ewing³³ in 1918 described adenomyomas present in the broad and round ligaments, groin, vaginal wall, Fallopian tube and rectum.

In 1921 Sampson³⁴ published his first paper on endometriomata and discussed the perforating hemorrhagic (chocolate) cysts of the ovary. It was due to the meritorious work of Sampson that this renewed interest in endometriomas was aroused in the gynecologic field with a notable academic revival and discussion of their etiology. This author postulated that endometriomas were derived from uterine mucosa which reached the ovary via the Fallopian tubes or through the lymphatics. The viability of desquamated endometrial epithelium has been seriously questioned on account of the necrosis and necrobiosis of the surface endometrium in menstruation resulting from the lytic action of menstrual secretions as shown by O. Frankl.³⁶ This also affects plant life as demonstrated by Schick;³⁷ and Macht and Lubin³⁸ have also isolated a menotoxin from the menstrual discharge.

Robinson³⁵ in a masterly critical review on the histogenesis of heterotopic endometrial proliferations questions very seriously Sampson's views on implantations of desquamated endometrial epithelium. Cron and Gey³⁹ find that the menstruating endometrium is not only viable but can be grown in tissue cultures.

The dissemination of endometrium through the tubes will require further proof in spite of the fact that endometrial particles have been found free in the lumen of the tubes. E. Novak⁴⁰ in his studies of ovarian metastasis from primary carcinoma of the uterine body has often observed free cancer masses in the lumen of the tubes but interprets this finding as a downward movement toward the uterus rather than upward toward the peritoneum. With more careful study of lymphatics the so-called "implantation" and "contact infection" by new growths is viewed with increasing skepticism by many pathologists.

Van Oettingen and Luden⁴¹ reported very striking findings in a series of twenty ovarian cysts containing endometrial tissue which they divide into a superficial group and a deep group. In the latter group they were able to trace the origin of the organoid tumors to the ovarian epithelium and concluded that since it had a definite connection with the surface of the ovary, Sampson's theory was incorrect. In a study of ovarian endometriomas by Semb,⁴⁵ the follicular epithelium is considered the source (histogenesis) of these endometrial growths.

Heany⁴², Danforth⁴³, Schochet⁴⁴, and Selig have reported implantation endometriomas in the abdominal wall and appendix.

Additional citations of the clinical literature of papers on endometriosis, except for the experimental contributions, are omitted, as this will only mean futile reiterations of the conflicting theories of etiology without adding any definite data or clearer understanding of the problem.

EXPERIMENTAL ENDOMETRIOSIS

In spite of the great amount of experimental research upon the subject of tumor formation, no one has yet devised a method by which tumors of any organ in any known animal can be induced at will. Efforts to produce endometriomas have passed several phases suggested by theoretical views. Transplantation of adult tissue was early found by Zahn⁴⁶ and Leopold⁴⁷ to result in eventual and usually prompt absorption. Lengemann⁴⁸ followed the fate of misplaced cells and concluded that misplacement alone, hyperemia, or partial degeneration of the cell mass was not sufficient to produce tumor growth. However, Nichols⁴⁹ in his extensive series of tests found uterine epithelium to undergo definite proliferation. Ribbert implanted portions of organs in the peritoneum, and although they functioned for a time in these new positions, yet they eventually atrophied.

Stillings⁵⁰ in 1909 transplanted successfully fragments of the uterus into the spleen of rabbits with subsequent cyst formation.

Schochet⁵¹ in 1914 in a series of transplants of ovary in the anterior chamber of the eye failed to note a hyperplasia or metaplasia of the surface epithelium of the ovary or peritoneum into endometrial-like tissue. Hesselberg, Kerwin and Loeb⁵² successfully transplanted endometrium into the ear of the guinea pig.

Evidence for growth stimulation by chemical agencies is furnished by the proliferation and hypertrophy which takes place in the uterus⁵³ and mammary gland during pregnancy. Robert Frank⁵⁴ produced similar changes with lipid fractions of extract of placenta and corpus luteum. Frank⁵⁵ has shown that transplanted bits of uterine tissue are stimulated to grow by these substances thus excluding a nervous control of growth.

In 1922 Jacobsen⁵⁶ reported successful autotransplantation of endometrium in the peritoneal cavity of the rabbit. This work has been confirmed by Katz and Szenes⁵⁷, Blair Bell⁵⁸ and Dossena⁵⁹ on the rabbit, guinea pig, and rat. These observations support Sampson's idea that fragments of endometrium on reaching the peritoneal cavity may become implanted on various organs and grow. Similar successful implants in cesarean scars in the guinea pig and mesoappendix in the dog are reported by Schwartz⁶⁰, and O'Keefe and Crossen⁶¹.

It is hoped that this short review and survey of the literature of experimental endometriosis will give the reader a proper perspective of the subject. While conflicting views of the etiology of endometriomas have been cited, this should not obscure our subject matter but make us realize that we are embarked on the fog-bound and uncharted sea of tumor formation and that we are likely to fix our attention on simple variables with information of little intrinsic value and that we are likely to lose our bearings.

MATERIAL AND TECHNIC

Virgin female guinea pigs supplied by the local dealers were used in this study. In most instances two or three estrous cycles were recorded for each animal before the experiments were performed. In this manner definite data were available to permit us to operate in the proestrous stage. In our earlier experiments rabbits were used, but after nine months of study we came to the conclusion that estrous cycles could not be followed in this form and that the rabbit was not a suitable animal for this particular phase of study.

In our later studies the guinea pig was the only animal used, as there is a definite rhythmical "heat period" in this animal. The estrous

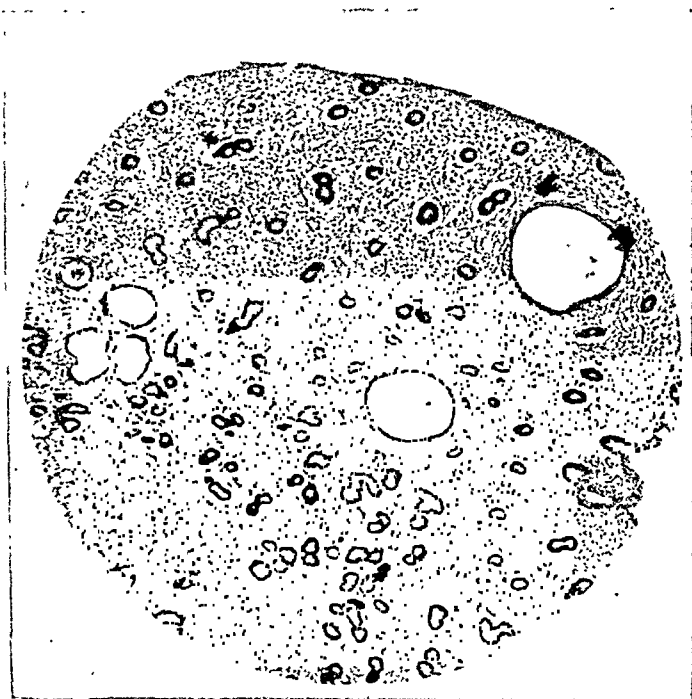


Fig. 1.—Diestrum, period of rest. Tenth day. 60x.

cycle in the guinea pig has been solved by the epochal work of Stockard and Papanicolaou.⁶² Our observations are in accord with these authors but for few exceptions which are noted in the descriptions of the stages, which are taken almost verbatim from their publications. We repeat in part their descriptions of the normal stages of the cycles to present more clearly our findings of the transplants. The terminology is that proposed by Heape⁶³ and adopted by Marshall⁶⁴ and others. "Proestrous, the first part of the sexual cycle; estrous, especial period of desire in the female; metoestrum, the short period when the activity of the generative system subsides and the resting condition is resumed in case conception does not occur; diestrum, the short period of rest between cycles. These four periods, the proestrum, estrum, metoestrum and diestrum are known as a diestrous cycle. Guinea pigs

kept in a state of domestication and under uniform environmental conditions possess a regular diestrous cycle repeating itself in the non-pregnant female about every sixteen days. During each cycle typically corresponding changes are occurring in the vagina, the uterus, and the ovary. Each period of sexual activity lasts about twenty-four hours and is characterized by the presence of a definite vaginal fluid which is easily observed by examination on the interior of the vagina. From six to twelve hours or even more, the secretions are of a mucous consistency (proestrus). The second stage is characterized by a thick cheese-like substance (two to four hours) which finally becomes slowly liquified and serous (four to six hours). The fourth stage is the shortest, only one or two hours long, and is characterized by the presence of



Fig. 2.—Proestrus, first part of sexual period. 70x.

blood.” In our series of 80 guinea pigs we failed to note the presence of blood except in very few instances. In animals killed in the fourth stage in only one instance did we observe the presence of free blood below the epithelial layer. In many instances we noted the presence of an epithelial cast of the upper part of the vagina which could be removed with tissue forceps.

“During the sexual period of twenty-four hours the organs are congested, the blood vessels tortuous and dilated, and the mucosa is of a darker red hue which soon disappears after the estrous period.”

In the course of our experiments it was noted that the vessels in the transplants showed a periodic rhythmic contraction. This phase of the problem was delegated to my associate, J. E. Markée, who has carefully studied the changes during the cycle.

HISTOLOGIC STRUCTURE OF THE UTERUS

The epithelial layer of the uterus in diestrus is of a ciliated cuboidal type. Mitotic figures are not present in this stage. Cyst formation is frequently observed about the tenth day of the cycle. The blood vessels are small; the stroma shows very few wandering cells, except for a few leucocytes (Fig. 1).

In the proestrous stage the epithelial layer is tall columnar in type, closely packed, giving the appearance of a pseudostratified layer. The cells contain much secretion, and small extrusions or knobs of secretion can be seen in the lumen of the glands. The capillaries in the stroma are congested, and migration of leucocytes is often seen (Fig. 2).

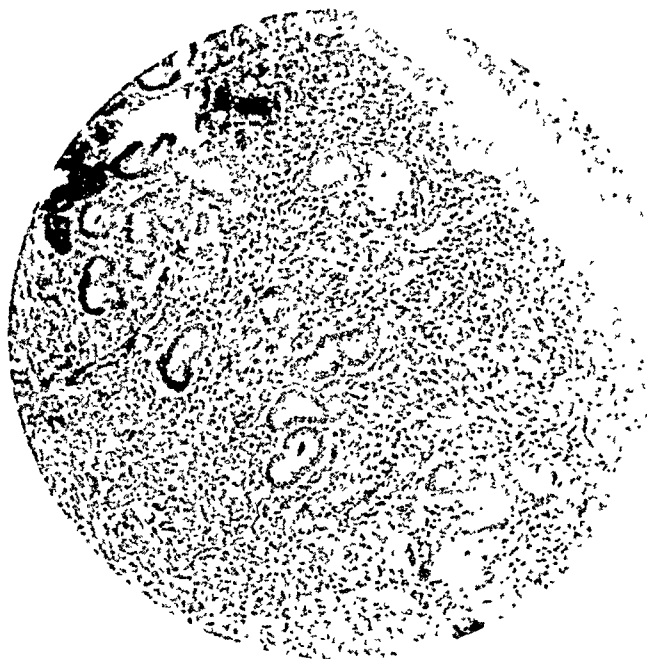


Fig. 3.—Estrum, period of desire. 140x.

In the estrous period the vessels are more congested; mitotic figures are frequent, and collections of polymorphonuclears beneath the epithelial cells are frequently observed (Fig. 3).

RHYTHMIC CAPILLARY CONTRACTIONS IN THE TRANSPLANTS

These observations of capillary changes are included in this paper as they were observed in our experimental endometrial transplants. It is difficult to interpret their true significance or their relationship to the menstrual cycle.

SUMMARY BY J. E. MARKEE

The vascularity of the uterus of the guinea pig undergoes cyclic variations that make it appear to blush and blanch. Both the speed and the extent of these vascular changes are affected by the time of

day and the stage of the estrous cycle. We have been unable to find similar vascular changes in any other tissue, either in situ or in transplants to the anterior chamber of the eye, of pancreas, islands of Langerhans, vas deferens, uterine muscle, heart muscle or liver. It is possible to make much detailed observations on endometrium transplants into the anterior chamber of the eye. The blanching and blushing can be studied by means of a binocular microscope. By comparison with a Tallqvist hemoglobinometer we found that the two colors were comparable with the colors indicated by 0 and 60 per cent hemoglobin respectively.

We made twenty-minute records every two hours for three complete estrous cycles of sixteen days each. Two of the records were made on one animal and one on another. Kymograph records were made of the color changes by means of a graduated dial and a muscle lever.

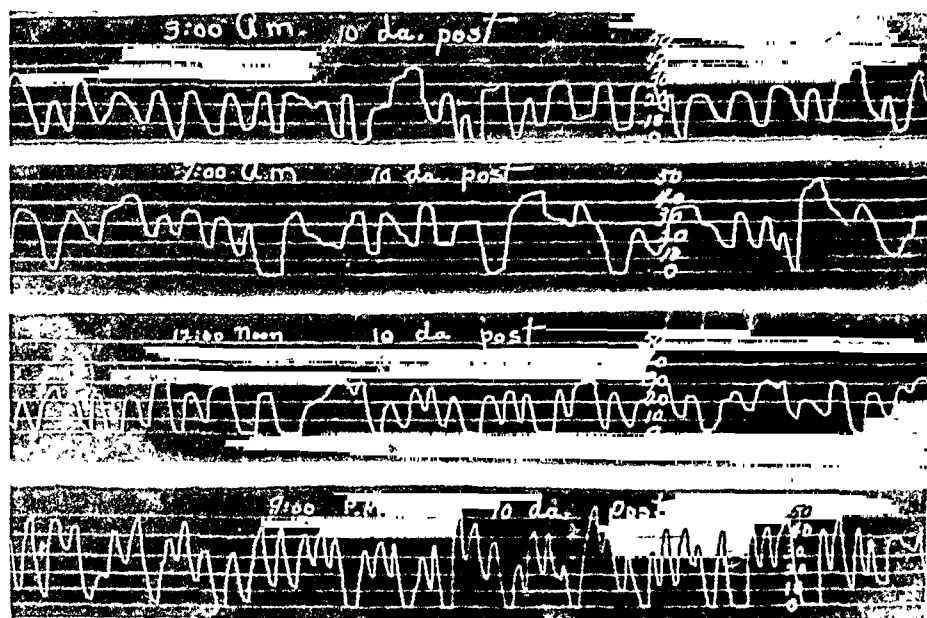


Fig. 4.

The first group of kymograph records illustrates the four typical phases of the vascular reaction seen every day of the estrous cycle except during estrus. The first record was taken in the early morning. The vascular changes occurred about every twenty seconds; the average color was about 25 per cent hemoglobin, and the transplant was completely blanched or white about 6 per cent of the total time. In the forenoon both the speed and the extent of the reactions are increased. At this time they recur about every fifteen seconds; the average color of the transplant is considerably above 30 per cent hemoglobin and it is completely blanched about 10 per cent of the total time. From noon until 3 P.M. the speed and especially the extent of the vascular changes are greatly decreased. They recur about every eighteen or nineteen seconds. The time in complete blanch is less than 10 per cent of the total time and the average color is about 25 per cent hemoglobin. The height of the vascular activity is reached in the late evening from about 8:00 P.M. until 11:30 P.M. The vascular cycles recur about every twelve or thirteen seconds. The amount of time in complete blanch is

more than 12 per cent and the average color is about 35 per cent hemoglobin. These four phases: the lowest activity in the early morning, an increase in the forenoon, a slight decrease about noon and the height of the activity in the evening, are found throughout the cycle except during estrus. (Fig. 4.)

The second group of kymograph records illustrates the effect of estrus on these vascular changes. The first record illustrates the condition during proestrus. Two hours before this record was taken, the vascular changes were recurring every thirteen seconds, and the transplant was completely blanched 16 per cent of the total time. When this record was taken, the changes were recurring every twenty seconds and the amount of time in complete blanch had dropped to about 8 per cent. There was a decrease of about 40 per cent in the vascular activity of the transplant during this two-hour period. At this time of day there would normally have been an increase. The second record illustrates the condition during the whole of estrus. This animal was

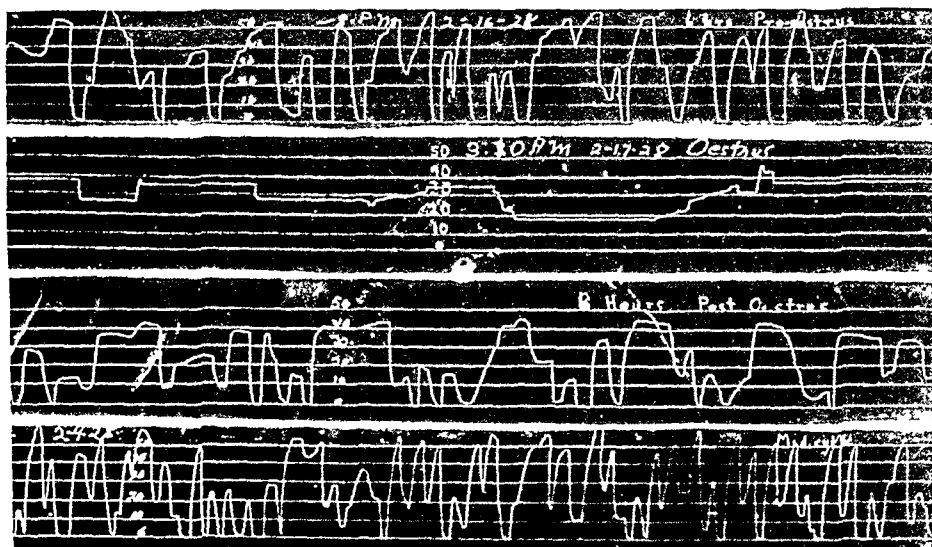


Fig. 5.

in estrus as determined by the vaginal smears and other methods from 2 A.M. until 7 A.M. There were no vascular changes that compared in extent with those found at all other times in the estrous cycle. The color of the transplant for this five-hour period remained around 25 per cent, neither falling much below 20 per cent nor rising much above 35 per cent.

The third record illustrates the condition during postestrus. The vascular cycles reappear at this time, and there is a very rapid return to the condition found during the diestrus. However, the long plateaus at about 40 per cent hemoglobin are typical of this stage. The last record illustrates the height of activity reached during the diestrus when the vascular reactions sometimes recur every twelve seconds, the average color of the transplant is above 35 per cent hemoglobin, and the transplant is completely blanched 16 per cent of the total time. (Fig. 5.)

After training an animal to sit still we were able to observe the capillaries through a microscope. The small blood vessels in the transplant

alone appeared and disappeared about every fifteen seconds while the blood vessels leading to the transplant as well as all the other vessels in the eye remained unchanged.

We have been unable to observe this phenomenon in well-vascularized transplants of uterus in immature animals.

The facts briefly summarized are: These vascular changes are influenced by the time of day, being at their lowest ebb in the early morning, increasing both in speed and extent in the forenoon, decreasing again about noon and reaching their height late in the evening. They are also influenced by the stage of the estrous cycle, slowly during proestrus until they disappear completely at the time of estrus and then reappear rapidly in postestrus. These gross changes are caused by great variations in the amount of blood in the capillaries and arterioles.



Fig. 6.—Uterine transplant in liver of rabbit No. 4, nine months after transplantation. Note cyst formation. 60x.

EXPERIMENTAL TRANSPLANTS

Series I, Normal Controls. Group A.—In this series five female guinea pigs were used. The animals are in proestrous stage. Under ether anesthesia and strict surgical asepsis the abdomen is opened by a low midline incision measuring three-fourths of an inch. The left horn of the uterus is excised, bleeders in the broad ligament are ligated, raw surfaces covered with peritoneum, and the abdominal cavity is closed in layers with linen sutures. A second midline incision is made in the upper part of the abdomen below the ensiform cartilage. The left lobe of the liver is delivered through the incision and a small longitudinal section of the uterus is implanted into the liver substance. In two of the controls transplants were also made into the spleen and subcutaneous tissues. To identify these transplants, we placed a small knot of black thread in one of the corners of the transplant. The remaining part of the uterus was fixed in formol-zenker solution for microscopic study.

Group B.—In this series transplants were made in the anterior chamber of the eye.

The animals were killed at varying periods of time and sections of the transplants and the remaining horn of the uterus sectioned and examined. In most instances the animals were killed after three months with the exception of one

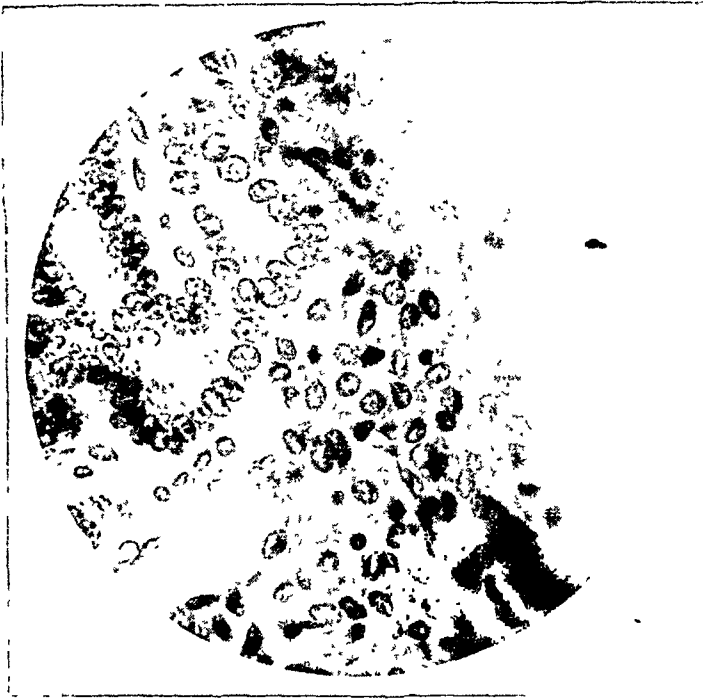


Fig. 7.—Metaplasia of uterine epithelium, or a degenerative process in eye transplant.

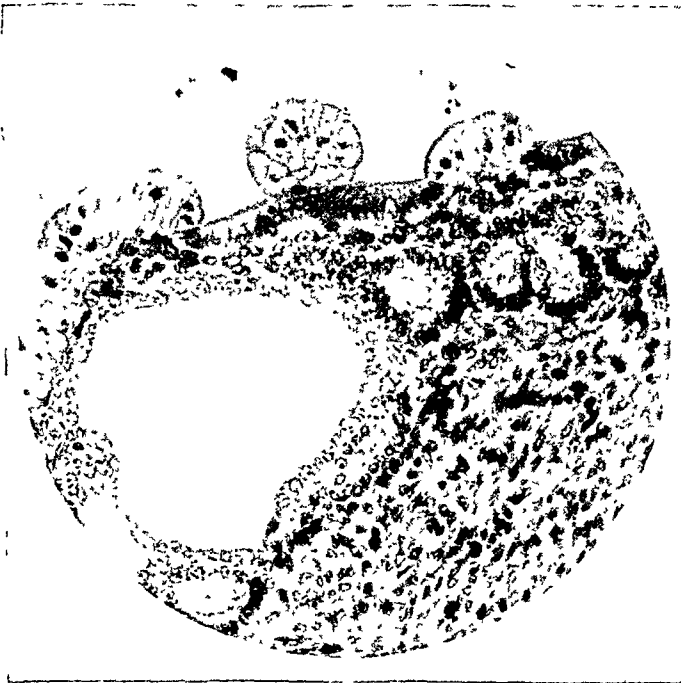


Fig. 8.—Metaplasia of uterine epithelium of eye transplant. Transplanted seven months before animal was killed. 290x.

guinea pig and two rabbits from our first group of experiments. Rabbit No. 4 was killed nine months after making transplants in the liver and spleen.

We found like many other investigators that the untreated endometrial transplants were eventually absorbed without active proliferative growth except for cyst formation in the rabbit No. 4 as seen in Fig. 6 and in group *B* of eye transplants. In those animals in which early vascularization of the transplants takes place, the endometrium is not absorbed after several months. In one of the animals of this group there was a metaplasia of the uterine epithelium. The cells were larger, filled with secretion, the nuclei more vesicular, and in a number of the serial sections there was an apparent proliferation with a pseudo-papillary arrangement or budding of the surface epithelium of the glands in the aqueous fluid of the eye (Figs. 7 and 8).

Series II. Scharlach R. Sudan III Ether Solutions.—It has been shown that cells treated or influenced by lipid solvents tend to exhibit increased and atypical proliferation. In 1906 B. Fischer⁶⁵ introduced an interesting field of study by



Fig. 9.—Downward growth and proliferation of epithelium of vaginal mucosa after olive oil and scharlach R injection. 70x.

injecting under pressure a saturated solution of scharlach R in olive oil under the skin of rabbits' ears. After a few days there is a marked proliferation and downward growth of epithelium which resembles an epidermoid carcinoma, but the growth ceases when the oil has been absorbed. Since no such effect followed injection of olive oil, Fischer assumed that the dye contained a stimulating substance for epithelial growth. These observations have been verified by many investigators.

In *Group A* of this series we repeated these classical experiments with the vagina. There was a marked proliferation and downward growth of the epithelium of the mucosa, as seen in Fig. 9. Sections from these areas were then transplanted into the liver and anterior chamber of the eye. The epithelial cell of the mucosa continued to grow but formed only epithelial cysts and no atypical proliferation under these conditions. The cavity of the cyst is filled with cornified epithelium and debris. The wall of the cyst is lined by a stratified cuboidal epithelium as found in epithelial cysts in other organs (Fig. 10).

Group B.—Similar experiments were made with the uterus in situ in which the scharlach R was injected beneath the mucosa through the serous and muscular layers. After several days sections were transplanted into the liver and anterior chamber of the eye.

No additional evidence was noted in our experiments than found in the classical experiments of B. Fischer. The glandular epithelium remains intact but shows no evidence of further proliferation but rather absorption and fibrosis of the transplant.

In *Group C.* of this series we substituted a 1 per cent ether in physiologic salt solution. Pieces of endometrium were exposed to this lipid solvent for varying periods of time prior to transplantation to the liver. Reinke⁶⁶ noted atypical epithelial growth after injecting a 4 per cent ether solution in the eye of a salamander. He then transplanted this proliferating epithelium to other salamanders. There was marked atypical proliferation in these grafts.



Fig. 10.—Eye transplant of vaginal mucosa after olive oil and scharlach R injection. Epithelial cyst with cavity filled with desquamated epithelium. 70x.

In our series of animals we obtained only negative results. Although the transplanted gland cells in the liver appeared more deeply stained, cystic, and showed mitotic figures, we were inclined to interpret this as a result of degeneration rather than active growth.

Group D.—In this series of experiments a modification of the scharlach R method is introduced. It has been shown that when lycopodium spores⁶⁷ are introduced into the body there is an extraordinary new formation of cellular fibrous tissue. With this idea in mind, lycopodium spores were added to the saturated scharlach R olive oil solution with the object of adding an irritant factor to the growth stimulus. With this method we obtained hyperplasia of the glandular elements and also an extensive new formation of cellular fibrosis; we were not able to interpret these factors as stimuli to growth. It is difficult to determine that this apparent proliferation is not reparative in compensation to degenerative and inflammatory changes, and therefore possibly obeying some other biologic law (repair to injury) than that of a simple reaction to a chemical irritating



Fig. 11.—Endometrial transplant in liver after scharlach R and lycopodium. Note hyperplasia of glandular structure, giant cell formation (tubercles) and areas of degeneration. x140.



Fig. 12.—Effects of sensitization of mucosa of endometrium. Compare with Fig. 3, the control. There is a marked glandular hyperplasia which appears as an adenomatous growth with absence of any inflammatory process. (Cells of inflammation.) 110x.

stimulus. In Fig. 11 cellular proliferation and areas of degeneration (necrosis) are present while in other areas there is definite giant-cell formation with pseudo-tubercle formation. And in spite of this active reparative process, there was no marked cellular proliferation of the endometrial glands, which we are willing to

interpret as active hyperplasia and proliferation as seen in benign tumor formation.

Series III. Group A.—This group of experiments is based on the principle of Loeb's⁶⁸ artificial parthenogenesis and fertilization. He employs a hemolytic substance, acids, bases, et cetera, followed by a hypertonic solution. Our experiments are based on the principle of cell stimulation induced by variations of osmotic pressures of solutions and an oxidase to alter or change the physical condition of the cell wall. We shall not attempt at this time to make a detailed analysis of the principles involved but merely to give a short detailed description of one of the experiments. We are inclined to believe that this field of research will open new avenues of approach to cell growth.

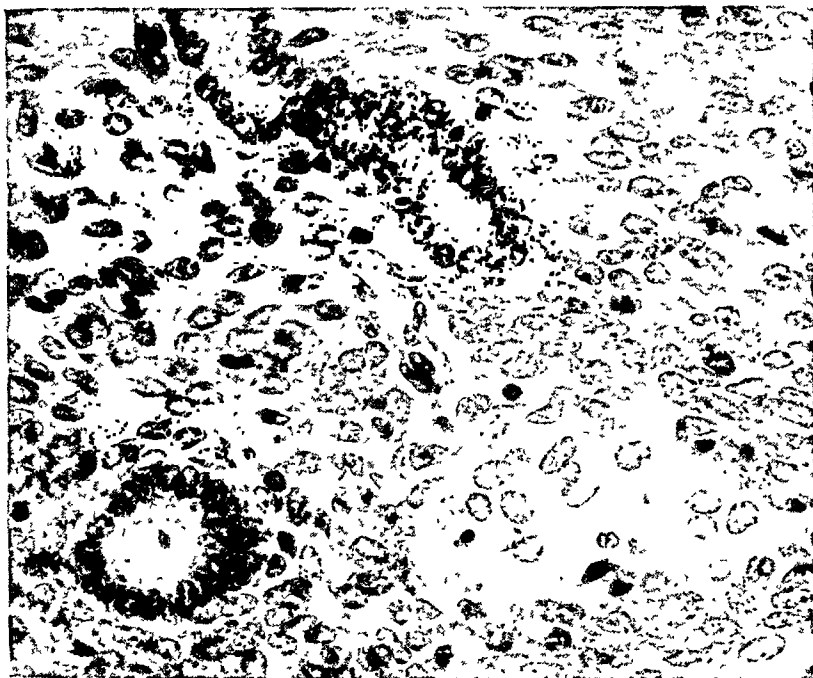


Fig. 13.—Syncytial formation from base of one of the glands from transplant. This condition has been observed in human endometrium following rapid growth of proliferating endometrium.

EXPERIMENT C 64

A mottled gray female guinea pig. Laparotomized June 11, 1928. The left horn of the uterus was excised and control fixed in formol-zenker solution. A small section of the mucosa was placed in an isosmotic solution of strontium chloride from 11:10 P.M. to 11:15 P.M.; transferred to rabbit's serum 11:15 P.M. to 12:08 A.M. and then placed in a hypertonic salt solution (12.5 grams sodium chloride solution to 1000 c.c. of water) from 12:08 A.M. to 2:02 A.M. Washed in Ringer's solution for one minute and then transplanted into the anterior chamber of the eye of this animal. The guinea pig was killed on 6/28/28. Fig. 3 is the control utilized in this paper to show the estrous cycle. Fig. 12 shows effect of sensitization.

Series III, Group B.

Series III, Group C.

Series III, Group D.

Series IV.

These groups are merely cited because Figs. 13, 14, and 15 were taken from some of the sections of these groups. A detailed description will be



Fig. 14.—Marked glandular hyperplasia of endometrial transplant from the anterior chamber of the eye.



Fig. 15.—Similar to Fig. 14 taken from another area of eye transplant.

published when these experiments are completed. Fig. 13 shows a syncytium formation from one of the uterine glands. Figs. 14 and 15 showed marked hyperplasia of glandular tissues of transplants.

We choose to postpone the final conclusions of our work until the other groups of this series are completed.

The writer wishes to acknowledge his indebtedness to Dr. George W. Bartelmez under whose supervision this problem has been undertaken. To Dr. R. R. Bensley for many helpful suggestions and criticisms, and to Dr. James Ewing (New York) for his interpretation of sections of transplants. Thanks are due to Mr. J. E. Markee for assistance in the preparation of histologic slides.

REFERENCES

- (1) *von Rokitansky, C.*: Ueber Uterusdruesenneubildung im Uterus, u.s.w. Ztschr. d. k. k. Gesellsch. der Aertze zu Wien, 1860. (2) *von Recklinghausen, E.*: Ueber die Adenocysten der Uterustumoren und Ueberreste des Wolffschen Ganges, Deutsche med. Wchnschr. 19: 825, 1893. (3) *Idem*: Ueber Adenomyome des Uterus u. der Tube, Wien. klin. Wchnschr. 8: 530, 1895. (4) *Idem*: Die Adenomyome und Cystadenome der Uterus u. Tubenwandung; ihre Abkunft von Resten des Wolffschen Koerpers, A. Hirschwald, 1896, Berlin. (5) *Chiari, H.*: Zur pathologischen Anatomie des Eileiterkatarrhs, Prager. Ztschr. f. Heilk. 7: 127, 1887. (6) *Martin, A.*: Ueber Tubenerkrankungen, Ztschr. f. Geburtsh. u. Gynäk. 12: 298, 1887. (7) *Cullen, T. S.*: Adenomyoma of the Round Ligament, Bull. Johns Hopkins Hosp. 7: 112, 1896. (8) *Idem*: Adenomyoma of the Rectovaginal Septum, Bull. Johns Hopkins Hosp. 28: 343, 1917. (9) *Idem*: Adenomyoma of the Rectovaginal Septum, J. A. M. A. 62: 835, 1914. (10) *Idem*: Adenomyoma of the Rectovaginal Septum, J. A. M. A. 67: 401, 1916. (11) *Idem*: A Further Case of Adenomyoma of the Rectovaginal Septum, Surg. Gynec. & Obst. 20: 263, 1915. (12) *Idem*: The Distribution of Adenomyomata Containing Uterine Mucosa, AM. J. OBST. & GYNEC. 80: 130, 1919. (13) *Idem*: The Umbilicus and Its Diseases, P. 373, W. B. Saunders Company, 1916, Philadelphia. (14) *Idem*: Umbilical Tumors Containing Uterine Mucosa or Remnants of Mueller's Duct, Tr. South. Surg. Gynec. Assoc. 24: 475, 1912. (15) *Idem*: The Distribution of Adenomyomata Containing Uterine Mucosa, Arch. Surg. 1: 215, 1920. (16) *Pick, L.*: Ein neuer Typus des voluminoesen, paraophoralen Adenomyoms, zugleich ueber eine bisher nicht bekannte Geschwulstform und ueber totale Verdoppelung des Eileiters, Arch. f. Gynäk. 54: 117, 1897. (17) *Meyer, Robert*: Zur Genesis der Cystadenome u. Adenomyome des Uterus, Ztschr. f. Geburtsh. u. Gynäk. 37: 343, 1897. (18) *Idem*: Eine unbekannte Art von Adenomyom des Uterus, Ztschr. f. Gynäk. 49: 464, 1903. (19) *Idem*: Veit's Handbuch d. Gynäk. 1: 468, 1907. (20) *Idem*: Ueber entzuendlicheheterotope Epithelwucherungen im weiblichen Genitalgebiete, u. ueber eine bis in die Wurzel des Mesocolon ausgedehnte Wucherung des Darmepithels, Arch. f. path. Anat. 95: 487, 1909. (21) *Idem*: Ueber den Stand der Frage der Adenomyositis und Adenomyome im allgemeinen, und insbesondere ueber Adenomyositis seroepithelialis, Zentralbl. f. Gynäk. 36: 745, 1919. (22) *Iwanoff*: Monatschr. f. Geburtsh. u. Gynäk. 7: 295, 1898. (23) *Aschoff, L.*: Cystisches Adenofibrom der Leistengegend, Monatschr. f. Geburtsh. u. Gynäk. 9: 25, 1899. (24) *Ries, Emil*: Ztschr. f. Geburtsh. u. Gynäk. 37: 518, 1897. (25) *Wertheim und Wulffing*: Ztschr. f. Geburtsh. u. Gynäk. 44: 1, 1901. (26) *Lockyer, C.*: Fibroids and Allied Tumors, Macmillan Co., 1918, London. (27) *Kossmann, B.*: Arch. f. Gynäk. 54: 359, 1897. (28) *Baldy, J. M., and Longcope, W. J.*: Am. J. Obst. 45: 788, 1902. (29) *Opitz, E.*: Monatschr. f. Geburtsh. u. Gynäk. 20: 9666, 1904. (30) *Gottschalk, S.*: Samml. klin. Vortr. 275: 17, 1900. (31) *Klages, R.*: Ztschr. f. Geburtsh. u. Gynäk. 70: 858, 1912. (32) *Lockstaedt, P.*: Monatschr. f. Geburtsh. u. Gynäk. 7: 188, 1898. (33) *Ewing, James*: AM. J. OBST. & GYNEC. 10: 732, 1925. (34) *Sampson, J. A.*: Arch. Surg. 3: 245, 1921. Arch. Surg. 5: 217, 1922. AM. J. OBST. & GYNEC. 4: 5, 1922. Boston M. & S. J. 186: 445, 1922. Surg. Gynec. Obst. 38: 287, 1924. Arch. Surg. 10: 1, 1925. Am. J. Path. 3: 93, 1927. (35) *Robinson, M. R.*: Surg. Gynec. Obst. (36) *Frankl, O.*: Liepmann's Handbuch d. Frauenheilkunde, 11, 1914. (37) *Schick, B.*: Wien. klin. Wchnschr. 33: 395, 1920. (38) *Macht, D. J., and Lubin, D. S.*: J. Pharmacol. & Exper. Therap. 22: 413, 1924. (39) *Cron and Gey*: AM. J. OBST. & GYNEC. 13: 645, 1927. (40) *Novak, Emil*: AM. J. OBST. & GYNEC. 14: 470, 1927. (41) *van Oettingen, K., and Linden, H.*: Arch. f. Gynäk. 122: 718, 1924. (42) *Heany, N. Sproat*: AM. J. OBST. & GYNEC. 10: 625, 1925. (43) *Danforth, W. C.*: AM. J. OBST. & GYNEC. 10: 625, 1925. (44) *Schochet, Sidney S.*: AM. J. OBST. & GYNEC. 14: 684, 1927. (45) *Semb, C.*: Abstr. J. A. M. A. 86: 1878, 1926. (46) *Zahn*: Cong. Internat. Sci. Med. Geneva, 1877. (47) *Leopold*: Virchow's Arch. f. path. Anat. 85: 283. (48) *Lengemann*: (Lubarsch) Zur Lehre v. d. Gesch. Wiesbaden, 1899. (49) *Nichols*: J. Med. Research, 8: 145, (50) *Stillings*: Deutsche patholog. Gesellschaft 6: 122,

1903; und Beitr. z. path. Anat. u. z. allg. Path. 47: 499, 1910. (51) Schochet, Sydney S.: Anat. Rec. 10: 447, 1916. (52) Hesselberg, C., Kerwin, W., and Loeb, L.: J. Med. Research 38: 11, 1918. (53) Loeb, Leo: J. A. M. A. 64: 726, 1915. (54) Frank, Robert T.: J. A. M. A. 74: 47, 1920. (55) Frank, Robert T.: Surg. Gynec. Obst. 25: 329, 1917. (56) Jacobsen, V. C.: AM. J. OBST. & GYNEC. 6: 257, 1923; Arch. Path. 1: 1609, 1923; Arch. Path. 5: 1054, 1928. (57) Katz, H., and Szenes, A.: Zentralbl. f. Gynäk. 44: 2400, 1924. (58) Blair, Bell, W. B.: J. Obst. & Gynec. Brit. Emp. 29: 443, 1922. (59) Dossena, P.: Tumori 12: 291, 1926. (60) Schwartz, O. H.: AM. J. OBST. & GYNEC. 13: 330, 1927. (61) O'Keefe, C. D., and Crossen, R.: Missouri Med. J. 13: 330, 1927. (62) Stockard, Charles R., and Papanicolaou, G. N.: Am. J. Anat. 22: 225, 1917; and Science N. S. 46: 42, 1917. (63) Heape: Quar. J. Micr. Sc. 44: 1900. (64) Marshall: The Physiology of Reproduction, Longmans, Green and Company, 1922, London. (65) Fischer, B.: Deutsche patholog. Gesellschaft 10: 20, 1906. (66) Reinke, D.: Med. Zeitung 28: 579, 1907. (67) Lambert: Summarized Tr. Cong. Am. Phys. and Surg. 9: 63, 1913. (68) Loeb, Jacques: Artificial Parthenogenesis and Fertilization, Univ. Chicago Press, 1913, Chicago. (69) Ewing: Neoplastic Diseases, W. B. Saunders Company, 1922, Philadelphia. (70) MacCallum, W. G.: A Text Book of Pathology, W. B. Saunders Company, 1919. (71) Wells: Chemical Pathology, W. B. Saunders Company, 1920. (72) Aschoff, Ludwig: Pathologische Anatomie, Gustav Fischer, 1919, Jena. (73) Adami, J. George, and Nichols, Albert G.: Principles of Pathology, Lea and Febiger, 1911, Philadelphia.

55 EAST WASHINGTON STREET.

(For discussion, see page 413.)

A STUDY OF THE USE OF PARATHORMONE IN THE CONTROL OF MENSTRUAL BLEEDING

BY EDWARD ALLEN, M.D., F.A.C.S., AND H. C. GOLDTHORPE, PH.D.
CHICAGO, ILL.

(From the Departments of Gynecology and Pathology of Rush Medical College and Presbyterian Hospital)

WE HAVE been trying for the past two years¹ to control excessive menstrual bleeding with the parathyroid hormone. The primary rationale of this treatment is based on the increased coagulability of the blood encountered in hypercalcemia.² Added to this was the possibility that hypodermic medication with the active principle of the parathyroids might indicate to us some of the relationship between the ovarian and parathyroid secretions.

Beginning with the work of Collip,^{2, 3} investigators¹⁻⁴ have noticed the production of hypercalcemic states with the increased coagulability of the blood in laboratory animals, particularly dogs. This hypercalcemic state in dogs is characterized by anorexia, hemorrhage into the gastrointestinal tract, and death. According to Collip,³ this danger may be imminent when a serum calcium of 15 mg. per 100 c.c. of blood is reached. Hueper⁴ has reported depositions of calcium in excess of normal in many important organs obtained from dogs in which this hypercalcemic state has been maintained for some time.

As far as we have been able to ascertain no case has been reported of a fatality in the human nor has any one established a level of

hypercalcemia in man. In view of the experimental evidence and lack of established rules for dosage, we have had to be extremely careful in our experimental work on women.

It is difficult to evaluate clinical symptoms in different individuals, especially in women who are menstruating. Nausea, vomiting, headache, and a feeling of depression are a common accompaniment of the menstrual period. Therefore, we have discontinued medication in several instances where if we had had the courage to continue, more definite results might have been obtained.

METHOD

These experiments were conducted on a series of fourteen young women who complained of severe menorrhagia. All of them had been previously subjected, with only temporary if any results, to the usual hemostatic procedures, such as oxytocics, injection of foreign proteins, and operation. The foreign protein injections were given with the possibility in mind that the disturbance might be on an infective basis in spite of negative palpatory or operative findings. Eight of these patients had menstruated profusely from the beginning of their menstrual history. Subsequent observations are recorded in this paper on the four patients included in our preliminary report. Due to a change in services some of these patients have not been observed for the past nine months. However, the results include observations on most of them for at least three menstrual periods after all treatment had been discontinued. The research department of the Eli Lilly Company kindly furnished us with the parathormone used in all of these experiments.

RESULTS

CASE 1.—This patient is one on whom results have been recorded in the previous paper. Menstruation began at the age of ten. The first period was normal but the second period lasted twenty-one days and all subsequent periods have been profuse. She was first seen in our clinic at the age of eleven. She had been in the hospital six times for treatment, which included ergot, pituitrin, curettage, horse serum, and milk. Since that time she has been in the hospital for observation, four times for treatment with parathormone. Following the milk injections she had no reaction and there was some decrease in the amount of blood lost at the menstrual period but the effect did not last. When we began the parathyroid treatment the patient was seventeen years of age. She had been forced to give up her school work on account of general fatigue and loss of time at menstrual period. The periods occurred about every three weeks and lasted eight to nine days. During this time she used from twenty-four to twenty-eight large homemade menstrual pads.

We gave this patient forty units of parathormone (Lilly) intramuscularly, either alone or combined with large doses (180 grains) of calcium carbonate by mouth⁶ each day during the menstrual flow. This treatment was continued throughout five periods during the latter half of 1926 and January and February of 1927. During this period of treatment blood was withdrawn each day before the parathormone was injected.

During the first four periods the blood calcium did not vary more than the variation we have found to be normal for healthy women. The lowest calcium reading that we obtained in this period was 9.92; the highest 12.81. The intermenstrual periods during this time had lengthened to thirty or thirty-three days and the number of pads had decreased to twelve or fourteen. The patient had returned to school.

During August of 1927 we again treated the patient at period time during an extremely hot spell of weather. On the third day of the period following an injection of forty units of parathormone which had been repeated both of the preceding days and accompanied by 180 grains of calcium carbonate by mouth, the blood calcium rose to 13.42 per 100 c.c. The patient became very pale, nauseated, and complained of severe headache. The pulse varied from 120 to 140 per minute for several hours. The menstrual flow stopped. The clotting time determined by the capillary tube method decreased from three minutes to one minute, thirty seconds. Twelve pads were used during this period.

The patient has not received treatment since that time. The menstrual flow has gradually increased to its previous duration and amount. Four months ago the patient was married. She has not become pregnant neither has sexual contact varied the severity of the bleeding.

CASE 2.—This patient was also reported in our previous paper. Age twenty-six years. She began to menstruate at sixteen and was regular, twenty-eight day type which lasted six days, using eighteen pads. About June, 1925, the periods became longer, lasting at times two to three weeks. She was curetted February 18, 1926, but without relief. Pelvic findings were normal. Calcium variation in this patient varied from 9.9 to 11.10 mg. per 100 c.c.

In May, 1927, we gave the patient a series of parathormone injections totaling 200 units over a period of five days. At this time she had been bleeding continually for thirty-four days, using four pads a day. Her hemoglobin was 68 per cent Dare. She had been advised to have a vaginal hysterectomy for the bleeding by her previous physician. Two weeks later she passed through a normal menstrual period, using eighteen pads. When the patient was last seen, October, 1927, she had gained forty pounds and was menstruating regularly each month, using eight pads during a period which lasted three days.

CASE 3.—This patient, whom we also reported in our first series, had three periods of parathormone injections. During the first menstrual period the patient was given eighty units of parathormone on the first day of her menstrual period in two doses. She suffered from nausea, chills, vomiting, and severe headache. The temperature rose to 103.6 and pulse to 120. Blood calcium determined at this time showed only 10.52 mg. per 100 c.c. The temperature returned within two hours to normal, resembling a foreign protein reaction. The menstrual flow stopped for six hours and the period was shortened one day and by six pads. Forty units of the eighty used here were given intravenously and were followed by this marked reaction. During the next two periods smaller doses, but totaling eighty units, both subcutaneously and intravenously were given without reaction, however. We have not given any of the hormone intravenously since this time. The calcium variations were well within normal limits. Shortly after this the patient was married. We have had reports from her for a period of several months during which her periods were normal. She had not become pregnant.

CASE 4.—This patient was thirty-four years old. She had had a menorrhagia extending over a period of four years. This varied from a very profuse period during which she used three dozen pads in ten days to a constant flow lasting for a month or more at a time, during which she would use from one to two pads

a day. The patient had been curetted twice elsewhere without relief. The year previously she had been given a radium treatment, dosage not known. Following this she had an amenorrhea of one month followed by two relatively normal periods. Since that time she had been bleeding profusely as described.

The patient was given two series of parathormone injections. The first one, forty unit doses each day for four days accompanied by 150 grains of calcium carbonate by mouth each day. The blood calcium at the end of this period was 13.98. There was no reaction. Bleeding ceased entirely for ten days. Due to some oversight, when parathormone injections were begun again only twenty units were given each day. The patient continued to bleed and two weeks later an abdominal hysterectomy was performed. The pelvic organs were absolutely normal. Histologically the endometrium revealed possibly a few more than normal distended glandular spaces.

CASE 5.—Patient, aged twenty-one, began to menstruate at sixteen years and until three years ago had had normal periods. During the past two years she has menstruated two weeks out of each month, using about thirty-six pads. Pelvic examination revealed normal findings. This patient was given forty units of parathormone and ninety grains of calcium carbonate a day. The blood calcium varied from 9.96 to 15.5 per 100 c.c. Medication was stopped due to the high blood calcium. No untoward symptoms were noted. The menstrual period was about the same duration as usual but the number of pads was decreased by one-half.

The menstrual flow has gradually increased until the periods are almost as profuse as they were previously. Her family physician has been giving her milk injections during the past few months but we do not know with what results.

CASE 6.—This patient was thirty-three years old. She entered the hospital in May, 1924, complaining of menorrhagia of two months' duration. The periods had begun at fourteen and except for a period of menorrhagia occurring at the age of sixteen, the periods have been normal, although accompanied by a rather severe dysmenorrhea.

Vaginal examination at this time revealed the uterus in third degree retroversion. The cervix was dilated and a rather large amount of endometrial tissue removed, which on microscopic examination revealed the cystic-like spaces that seem to be associated with this type of bleeding. The uterus was brought into position by the Webster round ligament operation. The pelvis was otherwise normal. Seven weeks after this operation she began to bleed again and has been bleeding irregularly but profusely since that time.

She was given two series of parathormone, thirty units a day for a total of 150 units, plus 180 grains of calcium lactate per day. The blood calcium at the end of this time was 13.24, and the patient had stopped bleeding. The time and amount of this period were halved. During the second period at the end of 100 units the patient complained of some headache, nausea, and had a pulse of 100. We have not heard from her since this treatment was given.

CASE 7.—This patient was a Mexican girl, twenty-five years old. She began to menstruate at sixteen and had had a menorrhagia lasting from eight to nine days, using eighteen to twenty pads. She had been married for five years and had not conceived. During the last few months the menorrhagia had gradually increased until there was some blood loss practically every day. This condition had threatened the marital tie and demanded relief.

We gave this patient 160 units of parathormone along with 180 grains of calcium lactate a day. At the end of this time the blood calcium was 9.98 whereas it had been 10.34 before the treatment was started. There was no decrease in the bleeding, so the patient was advised to have a treatment with radium. Since the patient was presumably sterile and the bleeding was such an important equation in her

family affairs, we thought it best to make reasonably sure of our irradiation results. These results we hoped to obtain by direct effect on the endometrium. Fifty milligrams of radium were introduced into the uterine cavity to remain in twenty-four hours. We introduced a triangular sheet of one-sixteenth inch lead, slightly larger than the uterus through a colpotomy incision, placing it directly behind the uterus and between the radium and the ovaries. This was packed into place with a gauze pack which also held the uterus forward and far distant from the ovaries. When the radium was removed patient was given a whiff of ethylene, and the lead plate and packing also removed. The pelvis was entirely normal to inspection.

This patient had an amenorrhea of one month. She then began to menstruate normally, using eight to ten pads each period. The periods have occurred at twenty-six to twenty-eight day intervals for the last twelve months.

CASE 8.—This patient was twenty-five years old, married six years, and had had no pregnancies. She began to menstruate at fourteen and had always had a profuse flow. During the last year the periods which had lasted from eight to ten days with twenty to twenty-four pads, had grown closer together until the patient was spotting much of the time.

We gave this patient a long series of parathormone, twenty to forty units at a dose, adding calcium carbonate sixty grains three times a day. Treatment was discontinued only when bleeding stopped. These periods of relative amenorrhea lasted from three days to five weeks. The blood calcium varied from 9.97 to 12.37. The higher calcium levels coincided with the cessations in bleeding. This treatment lasted over a period of six months and since that time we have lost track of the patient.

CASE 9.—This was a patient who had always had profuse periods since the onset of menstruation at fifteen years of age. She is now twenty-four years old. During the last two years the menstrual flow has lasted from eight to twenty-one days. During this time she would use from two dozen to fifty menstrual pads. She had been given at various times, with indifferent results, the usual oxytocics, foreign protein injections, and had been curetted once. During a period of six months this patient entered the hospital twice for bleeding and general weakness. The blood count and hemoglobin at these times were approximately normal. She was given two courses of parathormone and calcium lactate without appreciable effect. Curettage was resorted to in order to control the bleeding. The pelvis was normal to palpation under gas anesthesia. The blood calcium ranged from 10.17 to 13.58 during the period of treatment. The uterine scrapings revealed very little if any change in the endometrium, although it appeared to be in the resting stage in spite of the bleeding. The return to normal after the curettages lasted from three to six months before the menorrhagia reappeared. During the past few months without any treatment the patient has returned to a normal menstrual flow lasting three to four days and using ten to twelve napkins.

CASE 10.—This patient was twenty-six years old. She had been married seven years, during which time she had had two spontaneous abortions at three months' term, the last one three years ago. She entered the hospital with a history similar to that of the two previous three months miscarriages, complaining of constant bleeding. The uterus was only slightly larger than normal, was soft and doughy. The cervix was dilated and the uterus curetted. No evidence of pregnancy was found, so the culdesac was opened and the pelvis inspected. Everything was found normal.

The patient had normal periods for several months but during the past year and a half has been bleeding from twelve days to two months at a time, using

one to two pads a day. We began parathormone injections, using forty units each day; also giving 180 grains of calcium lactate. This treatment was continued for six days. The bleeding stopped and during the six months that the patient remained under observation she had irregular periods appearing every three to five weeks, lasting three to four days, during which she used six to eight pads.

CASE 11.—A girl, aged fifteen years, who began to menstruate at thirteen years. During the first year the periods came only at five week intervals but lasted two weeks, using about forty pads. During the past year the patient has bled from three to three and one-half weeks, using about the same number of pads which are more thoroughly saturated. Fainting spells have followed menstruation twice during the last four months.

This patient entered the hospital in the mid-menstrual period for a basal metabolic rate determination, which revealed a -3 . She remained in the hospital three days and was given 120 grains of calcium lactate by mouth each day, added to which were forty units of parathormone given intramuscularly. The afternoon of the third day after the parathormone had been given for two hours the patient developed a severe headache, nausea, and a pulse of 136. She was extremely pale. The blood calcium had risen from 11.72 to 14.52. The patient was dismissed from the hospital late that evening in good condition and since that time has had normal menstrual periods lasting from four to five days, during which she soils from twelve to fourteen napkins.

CASE 12.—This patient was also a girl of seventeen who had had very profuse periods since the onset of menstruation at fourteen. During the last year the periods had continued from ten days to two weeks at a time, during which twenty-four to thirty-six menstrual pads were used. She was given a series of five parathormone injections of forty units each. She was so nauseated during periods that she was unable to take any calcium. The hemoglobin at this time by the Newcomer method was 44 per cent. The blood calcium at the beginning of the treatment was 10.66, at the end 10.50. Basal metabolic reading was $+11$. The patient had two normal menstrual periods of three days duration, using ten to twelve pads. Following this she was married and left the city. We have not heard from her since.

CASE 13.—This patient was thirteen years of age. She began to menstruate at eleven years. The flow had been profuse from the onset, the first period lasting seven weeks. The periods have been quite irregular. She has been flowing steadily for the last three months, using one to two pads a day. The hemoglobin was 58 per cent. Vaginal examination was negative. On January 21, 1928 basal metabolic rate was -26 . She was given thyroid, grain one-half, three times a day over several periods. Menorrhagia improved. On May 25, 1928 basal metabolic rate was $+9$; she had been bleeding for two weeks. She was given parathormone, forty units each day for four days. Bleeding stopped and did not reappear for three weeks. Bleeding reappeared and was so profuse that the uterus was curetted on August 3, 1928. Scrapings revealed an endometrium apparently normal.

CASE 14.—A young woman, nineteen years old, began to menstruate at fourteen. The longest interval between periods has been ten days. Most of the time it is only a spotting of blood, but the patient bleeds profusely at irregular intervals. She has been unable to finish her school work. Three years ago she was curetted with no relief. Endometrial specimens obtained at this time were quite normal. The basal metabolic rate was -13 . In a period of two weeks on thyroid therapy the patient developed an increase in the pulse rate and nervousness, so medication was stopped. There was no effect on the bleeding. Hemoglobin was 65 per cent. We gave her two courses of parathormone, 200 units each, distributed over periods

of five days each. Calcium carbonate, 120 grains a day, was given with the first period and calcium lactate, grains 180, was given daily during the second period. The blood calcium during the first series increased from 10.99 to 12.11 and in the second series from 10.35 to 14.56. At this time the patient developed severe headache, nausea, and a pulse which ranged from 120 to 140. The bleeding stopped. We have not heard from this patient since the last treatment.

Definite conclusions are hard to draw from such a small group of patients but we feel that the following points are of interest:

1. We obtained good results in five patients, fair results in six and poor results in three cases of severe menorrhagia treated with hypodermic injections of parathormone.

2. The optimum dosage seemed to be about forty units intramuscularly, given each day over a period of five days.

3. Most effective results were obtained by combining this medication with 120 to 180 grains of calcium carbonate or lactate by mouth per day.

4. Calcium levels bordering on the hypercalcemic state were obtained only five times, and only by this combination.

5. Patients having this high blood calcium (13.24 to 15.5 mg. per 100 c.c. plasma) usually complained of some headache, nausea, and a rapid pulse. Bleeding ceased at these levels.

6. Intravenous injections of parathormone would seem to be contra-indicated.

7. The same condition that causes the menorrhagia seems to predispose toward sterility.

8. Direct effect can be produced on the endometrium by radium and the ovaries protected by the insertion of a lead screen through the culdesac in patients where medication fails. We hope to be able to report additional resistant cases treated by this procedure in the near future.

We wish to express our thanks to Dr. N. Sproat Heaney for his help in this work.

REFERENCES

- (1) *Allen, Compere, and Austin*: AM. J. OBST. & GYN. 13: 156, 1927. (2) *Collip, J. B.*: J. Biol. Chem. 63: 395, 1925. (3) *Collip, J. B.*: J. Biol. Chem. 63: 439, 1925. (4) *Hueper, Wilhelm*: Arch. Path. 3: 14, 1927. (5) *Allen, and Goldthorpe*: To be published. (6) *Dragstedt, Lester*: Physiol. Rev. 7: No. 4, 1927.

55 EAST WASHINGTON STREET.

THE METABOLISM OF GALACTOSE

V. THE EFFECT ON THE TOLERANCE OF THE CYCLE OF REPRODUCTION

BY ALLAN WINTER ROWE, PH.D., AND MARY MCGUINNESS, M.A.,
BOSTON, MASS.

(From the Evans Memorial)

IN A PREVIOUS paper* we have reported the results of studies on the influence of ovarian activity upon the assimilation limit of galactose. The phase dealing with the several stadia of the reproductive cycle was omitted, as the agencies then operative, severally determine special and unique factors in the carbohydrate metabolism. The present paper communicates the results of studies during this physiologic period, with such interpretations as the facts seem to warrant. The problem is twofold, for, as has been previously noted, changes in the level of ovarian activity in the main parallel the changes shown by the sugar tolerance, while in the special phase now to be considered a wholly new and supplementary mechanism is engendered whereby the mammary glands synthesize galactose and lactose and produce an excretion of the latter by the breasts.

That the endocrine and exocrine activities of the ovary are closely related and seemingly mutually interdependent, will be conceded by all, but the description of the actual mechanisms with the allocation to cause and effect of the several factors involved constitutes one of the fundamental problems of present day science.

Waiving discussion of the putative endocrine stimuli of the several steps, modern thought regards the mechanism terminating in menstruation as a pseudogravidity which comes to an end because the impregnated ovum is lacking to condition the progress and outcome of a true pregnancy.

Frank¹ and his coworkers, on the basis of the Long and Evans² rat technic, regard the genesis of these several steps to be implicit in the production of a single female sex hormone produced initially by the follicle and found in the follicular fluid, later secreted by the corpus luteum, and lastly, arising from the placenta if conception has taken place. They demonstrate a cyclic appearance in the circulating blood of this hormone by the production of estrus in the spayed rat when blood extracts are injected. The onset of menstruation they regard as conditioned by the retrogression of the yellow body and consequent failure to secrete hormone into the blood stream, a disappearance of the active principle antedating the menstrual onset by an hour or two. Novak³ has stressed the possible inapplicability of the results of these

*See this JOURNAL, 16: 687, November, 1928.

interesting experiments directly to human menstrual experience, and his scepticism finds definite response in many others. Affirming the facts as stated above, he regards the causal factor as still undetermined but feels that the ovum from the previous ovulation may be an element. Yet others consider the maturing follicle as the active agent, and a large group consider the so-called interstitial cells to be the causal unit. Whether ovulation continues during pregnancy is not known. The persistence of the corpus luteum would be an argument against this.

As conception is possible even though there be no cyclic bleeding, it follows that ovulation may occur without menstruation, but equally, that the converse is apparently not true. The assumption so frequently made that the presence or absence of menstruation defines the level of functional activity of the ovary is only correct within certain definite limitations.

The second point, correlative to our thesis, is the consideration of lactation. Changes in the mammary glands are coincident with certain modifications in the level of activity of the ovaries and accessory portions of the reproductive mechanism. These coincidences have been most interestingly correlated by Halban.⁴ Limiting the discussion to the periods comprehended in the present study, we find the fact of pregnancy producing a growth impulse which prior to parturition adds a secretory activity first of colostrum and in a few days postpartum of milk. Ultimately the latter function ceases and involution of the breasts occurs. During this period of secretory activity, as noted above, cells in the breasts assume the function of synthesizing galactose, presumably from the circulating glucose and subsequently condensing the two sugars to form lactose.

It is generally recognized that throughout the period of pregnancy abnormalities of the carbohydrate metabolism occur. The appearance of glucose in the urine during pregnancy has been frequently remarked and depending upon the degree of pessimism of the writer, has been interpreted as diabetes, renal glycosuria, or a physiologic relief. The appearance of lactose just before confinement and its continuance, as determined by the course of the lactation period, have also received attention. There is a fairly diffuse literature on the subject, but the reports are highly conflicting. Much of the older literature can be discarded as the chemical methods employed lack accuracy and sensitivity. In a few of the later reports the incidence of glycosuria during pregnancy varies from the four cases in 468 (<1 per cent) reported by Cameron⁵ to the 10 per cent recorded by Hirschfeld.⁶ As the question was highly pertinent to the present study, the incidence of reducing bodies in the urines of several groups of pregnant and postparturient women was studied. All urines were tested with Benedict's copper reagent and if positive were quantitated with the familiar solution of

the same author. The patients were drawn from the several services of the Robinson Memorial.* Group *A* were women reporting to the Prenatal Clinic. Only twenty-four-hour collections were tested, as only by so doing was it possible to eliminate with certainty the glycurctic effect of a meal. Group *B* were house cases admitted for confinement and studied during their stay. The urines were two-hour specimens obtained by catheterization. The sugar was quantitated, and in addition both the mucic acid and Barfoed's tests applied. Occasionally an osazone was formed and its nature determined. Group *C* was similar to *B* but composed of different persons. The *D* group were patients from the postnatal service and had already been studied as members of either *B* or *C*. Again, as they were not under supervision, only twenty-four-hour collections were examined. The results of this preliminary series of observations follow below.

TABLE I. MELITURIA PREPARTUM AND POSTPARTUM

GROUP	DESCRIPTION	NO. OF CASES	MELITURIA	
			NUMBER	PER CENT
A	{ During pregnancy	100	18	18
	{ 4th to 9th month			
B	{ 1 day before delivery	50	19	38
	{ 3 days after delivery	50	50	100
	{ 4 days after delivery	50	50	100
	{ 10 days after delivery	50	46	92
C	{ 14 days after delivery	50	41	82
D	{ 6 months after delivery	50	40	80

Our figure for the incidence of glycosuria (prepartum) is significantly higher than those recorded in Table I. This is probably due to the fact that each case was examined on several different occasions (an average of over 7). On this basis 18 per cent showed glycosuria at some time during the pregnancy. Nearly 12 per cent, however, gave repeated tests, a figure in good agreement with that of Hirschfeld.

With confinement imminent, about one-third of the women showed lactose in the urine, while in the first few days following labor all of them had an appreciable lactosuria. The combined results with this group are given in Table II.

TABLE II. CHARACTER OF SUGAR

TIME OF COLLECTION	BENEDICT	MUCIC ACID	BARFOED	AVERAGE AMOUNT
1 day before delivery	+	+	0	—
3 days after delivery	+	+	0	0.86 gm.
4 days after delivery	+	+	0	0.77 gm.
10 days after delivery	+	+	0	0.26 gm.

It will be noted that in no case was glucose present in detectable amounts. The quantity of the sugar fell rapidly, and on the tenth

*The authors take pleasure in acknowledging their indebtedness to the staff of the institution.

day four of the women were sugar free. A still further drop is shown in the figures for the fourteenth day postpartum, but this latter condition remained practically unchanged after a lapse of six months. A few typical results with this last group are given in Table III.

TABLE III. CHARACTER OF SUGAR—SIX MONTHS POSTPARTUM

CASE	TIME AFTER DELIVERY	LACTATION	AMOUNT	SUGAR*	
				MUCIC ACID	BARFOED
A	180 days	Nursing	0.46%	+	0
Bl	171 "	"	0.21%	+	0
Bo	153 "	No (64 days)		negative	
Br	176 "	Nursing	0.43%	+	0
Bu	154 "	No (92 days)	0.39%	+	0
Ca	176 "	Nursing	0.37%	+	0
Co	185 "	"	0.52%	+	0
Ho	166 "	"	0.10%	+	0
Hu	178 "	No (156 days)		trace	
Jo	176 "	Nursing	0.49%	+	0
Le	161 "	"	0.20%	+	0
Lo	176 "	"	0.36%	+	0
O	194 "	"	0.27%	+	0
P	176 "	No (92 days)	0.39%	+	0
S	176 "	Nursing	0.46%	+	0

*Several of the urines were tested and gave lactosazone.

The striking feature here is the persistence of lactosuria in two cases respectively 92 and 156 days after interrupting nursing. It is only fair to assume that both possibly had some abnormality of carbohydrate metabolism which found expression in this condition. The presence of milk in the breasts regrettably was not determined. The amounts of sugar are reported in percentages, as it was practically impossible to persuade the subjects to bring the full collected amount.

The results given above would seem amply to confirm the numerous other records of melituria as a possible or probable incident of the reproductive cycle. In the lactosurias, overproduction is one patent explanation, but a similar explanation cannot be offered for the glycosuria observed in midpregnancy. In the main, it may be said that there is general agreement on the point that pregnancy tends to produce a lowering of the sugar tolerance, although the degree and frequency of incidence vary widely among the individual investigators. Reports like that of Bauch,⁷ who found no change in the galactose tolerance of pregnant women using a test meal of 40 grams, result from a failure to recognize the carbohydrate paradox.⁸

The numerous tests for the early determination of pregnancy, with modified carbohydrate tolerance as the basis, well express the trend of current thought even though all these procedures have been shown to be both positively and negatively misleading. That this should be so is not surprising when one considers that functional failure of the ovary always lowers sugar tolerance and may produce amenorrhea.

TABLE IV. PREGNANCY

CASE NO.	AGE (YEARS)	PARA	MONTH	WEIGHT DEVIATION	ALVEOLAR CO ₂ (MM.)	BASAL RATE DEVIATION	BLOOD SUGAR (MG.)	GALACTOSE TOLERANCE
A	B-207	ii	3	-19%	29	-23%	97	20
	B-299	i	3	+14%	34	-3%	100	20
	S-531	iv	4	+4%	27	-13%	83	20
	B-33	ii	6	+13%	24	-6%	94	20
B	An	i	6	+24%	32	+1%	84	30
	Pr	i	7	+43%	29	-1%	76	30
	Gi	ii	7	+63%	30	+8%	81	30
	Su	ii	8	+21%	27	+1%	75	20
	Ln	ii	8	+35%	34	+11%	89	30
C	H.M. 4	i	5	+12%	30	-9%	75	20
	H.M. 2	i	5	+5%	34	-5%	79	20
	H.M. 5	i	5	-4%	22	-7%	84	20
	H.M. 7	i	5	-11%	38	-7%	79	20
	H.M. 6	i	7	-12%	34	+18%	91	20
D	M-9	ii	0	+14%	45	-14%	100	40
	M-9	iii	2	+24%	35	-7%	100	30
	M-9	iii	9	+32%	41	-5%	91	20
	M-8	i	5	+13%	29	-9%	100	30
	M-8	i	9	+26%	37	-6%	100	20

The use of a single test susceptible to so many unrelated controlling influences for the definition of one of them, can yield but dubious results.

Following the general method outlined in the preceding paper, we have determined the sugar tolerance of a few pregnant women. The cases were drawn from four different sources, namely, the diagnostic service of the Evans Memorial (A), a few suitable cases from the Prenatal Clinic of the Robinson Memorial (B), from a small nursing home (C),* and two volunteers, one of whom was studied prior to conception, and both throughout the course of their pregnancies (D). The methods of the earlier studies were employed, namely, weight deviation calculated from both Dreyer⁹ (trunk length), and West's¹⁰ standards, alveolar carbon dioxide by the Fredericia apparatus,¹¹ blood sugar after Folin-Wu¹² and the basal rate by the closed circuit method (Benedict-Collins apparatus), and comparison with both the Harris-Benedict¹³ and Aub-duBois¹⁴ standards. The galactose tolerance was determined by the method already described by one of us.¹⁵

The results here are highly suggestive. In the first three groups, comprising fourteen cases, ten show the prepubertal level of 20 grams. The remaining four, who are positive with 30, are from the out-patient group who were the least controlled. All the house cases show the 20 gram level, and that seemingly irrespective of the month of pregnancy. The most informative cases are the two constituting group *D*. (Table IV.) The small number of the complete series counsels reserve in interpretation. It is safe to say, however, that pregnancy lowers tolerance and seemingly tends to produce an assimilation limit identical with that of the prepubertal years or produced by castration. The implication of this fact will be considered later.

The tolerance of a small group (10 cases) was determined two weeks postpartum. It was found impractical to carry out the regular routine, and so only the galactose test was performed. The detection with certainty of small amounts of galactose in the presence of appreciable quantities of lactose offers some little difficulty.

The urine was rendered neutral (on the acid side) to phenolphthalein as an indicator, and 25 c.c. were treated with 5 c.c. of a saturated neutral lead acetate solution. After the precipitate had settled, one drop of lead solution was added to be sure that the operation was complete. The filtrate from this, which gives a heavy white precipitate, with a carefully balanced Barfoed's solution, was next shaken for one minute with three grams of Lloyd's reagent and again filtered. From this second filtrate 5 c.c. were added to 5 c.c. of the Barfoed's solution and boiled for thirty seconds. A very slight white precipitate will appear when the reagent and urine are mixed, but it does not interfere with the characteristic indications of a positive copper test. Under the conditions as given, 0.1 per cent of galactose is detectable with certainty, and 2 per cent of lactose yields a negative result even with three minutes' boiling. The only precaution lies in the careful

*The authors express their thanks to Miss Dorothy Gallivan through whose courtesy these data are available.

TABLE V. SIX MONTHS POSTPARTUM

CASE	AGE (YEARS)	PARA	WEIGHT DEVIATION	ALVEOLAR CO ₂ (MM.)	BASAL RATE DEVIATION	BLOOD SUGAR (MG.)	GALACTOSE TOLERANCE
<i>Lactating</i>							
McD	24	i	+12%	31	-9%	109	30
St	25	iv	-0%	41	-13%	98	30
Mel	27	v	+39%	38	-3%	80	30
Ve	29	ii	-14%	39	-8%	94	30
Ch	36	ii	+7%	31	-11%	105	40
<i>Not Lactating</i>							
Fr	22	i	-21%	31	-8%	97	30 Stopped 7 days ago
Du	26	iv	-22%	39	-13%	92	30
Jo	27	iii	+28%	38	-5%	118	40
Cos	28	ii	+15%	42	-11%	95	30
McG	32	i	-11%	36	+2%	98	40
An	33	iv	+25%	43	-9%	94	40
So	35	ii	-7%	39	-13%	95	40
Ma	38	ii	+10%	45	-10%	111	40
Ke	40	x	+9%	37	-9%	100	40
Ho	41	iv	+49%	37	-4%	84	20 Pregnant

adjustment of the neutrality (slightly acid) relations, as basic lead acetate will carry down sugar and the Barfoed solution is very sensitive to a slight excess of acid.

With but one exception the threshold had fallen to 10 grams. The fact is presented without other present comment than that the saturation of the mammary glands with galactose is undoubtedly a factor in producing this unique level. The lowest recorded level for early childhood and for otherwise normal adult castrates is 20 grams. In the present case some superimposed agency must be operative, and the explanation offered above is an obvious one.

In the first group one of the subjects has regained the normal adult tolerance although still lactating, while the remaining four are still 10 grams below the norm. In the nonlactating group, six, or two-thirds, are fully normalized, and but three exhibit a tolerance level 10 grams below. One of these, it will be noted, stopped but seven days before the test. The case of Ho is added to the group as she had again conceived within six months of her earlier confinement. Her tolerance has fallen to the level which our experience associates with the later stages of pregnancy.

The data in Table V are consistent with the general trend. The high degree of saturation which is a feature in the early postpartum days has resolved itself into a state of equilibrium, and with the cessation of the function the glands gradually resume a state of sexual rest with resumption of the normal tolerance.

Supplementary information should derive from the study of cases in which pregnancy has been interrupted before its normal termination. Through the courtesy of the surgical staff, to whom we express our grateful thanks, eight such cases have been made available for this study. The collated data are in Table VI.

Of the three cases at the lowest level, one (Le) was a case of self-induced abortion by unknown means, the other two (Ke and Dee) seemingly spontaneous miscarriages, "Dee," however, being distinctly toxic while "Ke" had a basal rate of -22 per cent, a frankly hypofunctional level. Three of the four patients showing a level of 30 grams (O'B, Gl and Dim) were spontaneous miscarriages, while the fourth (Lo) was a fifteen-year-old girl whose abortion was produced by an extended series of douches supplemented by some drug. The one case with a normal tolerance of 40 grams (Be) had miscarried her previous pregnancy in the fifth month and the present in the fourth. There is some evidence here to suggest that with a sudden interruption of the pregnancy, the organism fails to react rapidly from the general state induced by the initial condition. With the miscarriage cases, on the other hand, the cause is seemingly endogenous, and it is possible that in some of them the condition producing the miscarriage was a progressive one of some duration. Possibly in these cases before the ter-

mination of the pregnancy the organism had begun those recessive processes which ultimately produce a normal level after the expulsion of the fetus. The number of cases is so small as to counsel extreme caution in the interpretation of results, and the above suggestion is only tentative. It is recognized that a larger series might produce results which would render this interpretation wholly untenable.

DISCUSSION

In discussing the details of this phase of ovarian activity, it must be remembered that two related but fundamentally different mechanisms are operative. The first, the hormonal influence, will be discussed later. The second, mammary activity, demands consideration. The several interrelationships can be presented in tabular form.

TABLE VII. RELATIONSHIP OF MAMMARY STATUS TO SUGAR TOLERANCE

PHASE	SUGAR TOLERANCE	BREASTS
Prepubescence	Low	Undeveloped
Mature	High	Developed
Pubescence	Increase	Increase
Menopause	Decrease	Decrease
Castration	Decrease	Decrease
Pregnancy	Decrease	Increase
Lactation	Decrease	Increase
Menstruation	Decrease	Increase (?)

In the static phases we find direct relation between degree of development and sugar tolerance. Further, in a single case,* ablation of the breasts for cosmetic reasons (malignancy lowers sugar tolerance) lowered the tolerance to the prepubertal level from that of normal maturity.

In the next three conditions, which are unassociated with lactation, we find a definite parallel between mammary states and sugar tolerance, as has been noted in the previous paper.

In the last three an antithetical relationship obtains which requires further comment. During pregnancy there is mammary increase with progressively falling tolerance. This, presumably does not mean saturation of the glands with lactose, as the melituria already discussed derives from the presence of glucose. With parturition the urine sugar becomes lactose, which is uniformly present, and the tolerance two weeks postpartum is lower than the prepubertal or castrate level. Here we undoubtedly have overproduction, and correlatively, saturation of the gland with galactose. As lactation progresses the tolerance rises, and while a subnormal level may be recorded after weaning, equally normal levels are found while the breasts are still secreting. Patently here are two agencies at work, the minor gland saturation superimposing on the major influence which manifests itself through-

*Seen through the courtesy of Dr. R. B. Greenough, to whom the authors express their sincere appreciation.

out the various levels of ovarian activity. Support for this thesis is found in the results during menstruation—a false pregnancy—where a lowered tolerance is recorded in those whose resting tolerance approaches the normal level. Whether the mammary growth impulse recorded at this period is an associated or coincidental phenomenon, has yet to be determined.

It would seem, from the foregoing, that mammary change is not the primary factor determining the fluctuations of sugar tolerance (with the possible sole exception of the early lactation level). That it does play an important rôle secondary to one, or probably more, hormone influences conditioned by the several phases of glandular activity, would seem to be equally demonstrable.

Turning to the hormonal factor, we find a number of facts for which no satisfactory formula has as yet been suggested. Frank's generalization is seemingly applicable to women in a state of sexual rest (with the exception of the time of the menstrual period) but is directly contradicted by the observations during the several phases of the active cycle of reproduction. Küstner has also observed a premenstrual glycosuria appearing at the time of maximum hormone concentration which, if correct, is directly contradictory. With the elimination of the follicular hormone, as defined by Frank, there remain two potential endocrine agencies, i.e., the interstitial cells and the corpus luteum. The former constitute the less productive line of approach, for devoid as they are of cyclic variation, these much discussed entities are always present except in the case of castration (and less certainly after the menopause). To endow them with causal powers is to connote a wide range of functional differences which at once presumes their influence to be secondary to some outside controlling agent. In other words, they too are seemingly eliminated from the picture as far as any primary influence is concerned. There remains then the corpus luteum which Frank envisages as no more than a link in the chain beginning with the follicle and ending with the placenta, determining his so-called gestational gland.

Our own studies, in their present form, fail completely to resolve the question. They deal with but one end-result of a wide variety of causes, many of which are so intrinsically concerned as to be, at the present time, insusceptible to experimental elimination. So far as these observations go, however, they may be felt to indicate the probable elimination of any primary participation of the so-called interstitial cells. It is true that these cells, derived from the atresia of immature follicles, may function prior to pubescence. Certainly they seem less important after this physiologic boundary has been passed.

The whole general question remains in an unresolved state. The present experiments, from the viewpoint of the authors, offer one very definite contradiction to the general theory of Frank, and, at the same

time, suggest an independent activity of the corpus luteum which may be a dominant factor in the several phases of sexual activity. It is doubtful if it is alone. Far more probably there are a number of agents at work each influencing a special phase or special phases of the complete sex progression. Even the interstitial cells may play a part, but if so, it is not demonstrably the dominant rôle assigned to them by one school of endocrine thought. The results of the study may be briefly summarized.

SUMMARY

1. The several stadia of sex development and activity seemingly influence the capacity of female to assimilate and utilize galactose.
2. Lowering of ovarian function, from whatever cause, produces a like change in the galactose tolerance.
3. Criteria are established for the normal galactose tolerance of the female during the several stadia of existence.
4. The mammary glands play a most important rôle in the determination of the assimilation limit, but one apparently secondary to hormonal agencies which seemingly are the primary regulators.
5. From changes in sugar tolerance, it may be inferred that pregnancy produces a physiologic hypo-ovarianism which persists for some time after parturition but ultimately disappears.

REFERENCES

- (1) *Frank*: J. A. M. A. 85: 510, 1925; 85: 1558, 1925; 86: 1686, 1926; 87: 554, 1926; Endocrinology 10: 260, 1926; AM. J. OBST. & GYNEC. 12: 585, 1926. (2) *Long and Evans*: Anat. Rec. 18: 241, 1920. (3) *Novak*: Endocrinology 11: 1731, 1927. (4) *Halban*: Arch. Gynäk. 75: 352, 1905. (5) *Cameron*: Canad. M. A. J. 9: 717, 1919. (6) *Hirschfeld*: Ber. klin. Wehnsehr. 47: 1053, 1910. (7) *Bauch*: Monatschr. Geburtsh. u. Gynec. 42: 258, 1915. (8) *Allen*: Glycosuria and Diabetes, Leonard, Boston, 1913. (9) *Dreyer*: The Assessment of Physical Fitness, Hoeber, New York, 1921. (10) *West*: Arch. Int. Med. 25: 306, 1920. (11) *Frødericia*: Hospitalstid. 57: 585, 1914. (12) *Folin and Wu*: J. Biol. Chem. 41: 367, 1920. (13) *Harris and Benedict*: Carn. Inst. Pub. No. 279, 1919. (14) *Aub and duBois*: Arch. Int. Med. 19: 823, 1917. (15) *Rowe*: J. A. M. A. 89: 1403, 1927.

TORSION OF THE FIBROMATOUS UTERUS*

BY THOMAS C. PEIGHTAL, M.D., NEW YORK, N. Y.

(From the Gynecological Service of the Roosevelt Hospital)

THE occurrence of torsion in the fibromatous uterus, often termed axial or axis torsion, is of sufficient rarity and the accidents accompanying this condition are of such gravity that it would seem wise to report even a single new case. Likewise, since a survey of the literature reveals no recent case reports from this continent, and since no exhaustive thesis on this subject has been found except in foreign journals, an attempt will be made herein to outline briefly the known facts and literature of this interesting condition and to append a sufficiently detailed bibliography hoping that this may stimulate others to report similar cases which have come under their observation.

Case Report.—Mrs. E. J. R., 58 years old, married 30 years, with no pregnancies, having had normal menstrual history with menopause seven years previously, was admitted May 13, 1926, suffering acutely from severe abdominal pain, nausea and vomiting of twenty-four hours duration. During the past two years she had had two or three similar attacks of less severity which had subsided spontaneously. Her family physician had noted the presence of fibroid tumors for several years and had advised operation which the patient refused.

The temperature was 100°, pulse 112, respirations 28. White blood count was 18,000 with 82 per cent polymorphs, urine negative, cardiorespiratory examination negative. The abdomen was markedly distended and tympanitic with the suggestion of slight degree of shifting dullness in the flanks. Palpation revealed moderate generalized sensitiveness and peritoneal reaction with an area of maximum tenderness and spasm in the left lower quadrant. In this region a mass could be felt which extended upward to a level three inches above the umbilicus. Bimanually this tumor seemed closely associated with the uterus and felt like a fibroid in consistency, but its size and smoothness of contour together with its position to the left of the midline resulted in the diagnosis of ovarian cyst with either a twisted pedicle or degeneration from some sudden circulatory disturbance.

The patient remained under observation for another twenty-four hours during which time the vomiting became less, her fluid depletion was partially overcome, and the bowel was emptied by irrigations. Her general condition was better with pulse 108, respirations 28, temperature 101.4°, and white blood count 24,000, polymorphs 90 per cent. However, more definite localization of pain over the mass along with the rise in temperature and blood count, gave clear indication for operative interference.

Operation.—Nitrous oxide-oxygen-ether anesthesia was given. Lower midline incision was made. Upon opening the peritoneal cavity about a liter of bloody fluid was found in the lower abdomen and pelvis. The intestines were distended, but no mechanical obstruction or adhesions were observed. The mass was identified as a large fibroid tumor not pedunculated but growing from the top of the fundus

*Read at a New York Obstetrical Society, October 9, 1928.

and closely associated with it. This mass had undergone a torsion on its long axis from left to right of slightly more than 180 degrees so that the left cornu had been drawn around and rested almost in the hollow of the sacrum. The fibroid and uterus had the bluish-black appearance of early gangrene while the adnexa were elongated, swollen to three or four times their usual size, and markedly cyanotic. The broad ligaments were distended with lymph and their veins dilated in some places to 1.5 cm. in diameter.

As there were no adhesions, the torsion of the entire mass including the uterus was easily reduced, after which it was discovered that the pedicle of this rotation had been in the region of the upper portion of the cervix. A complete hysterectomy was done using the remains of the broad ligaments for peritonealization, and pelvic

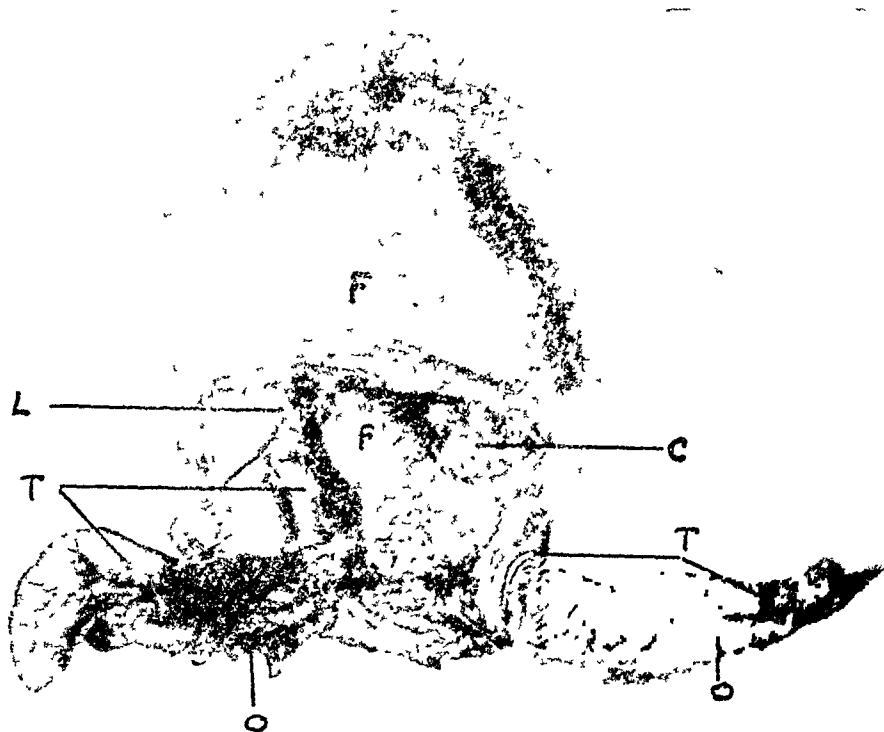


Fig. 1.—C, amputated cervix; F, fibroid, L, round ligament; T, tubes; O, ovaries

drainage was established through the vagina. The abdominal wound was tightly closed without drainage. The postoperative course was uneventful, the patient leaving the hospital twenty-five days later.

Pathology.—The gross specimen (fibroids, uterus, tubes and ovaries) was 18 x 14 x 12 cm. in size and weighed 2600 grams. Its main bulk was made up of a single large oval smooth fibroid tumor, 12 cm. in diameter, which had developed from the top of the fundus posterior to the uterine cornua, and was attached by a broad base so that it was definitely sessile and not pedunculated. Anteriorly between the uterine attachments of the round ligaments were two small pedunculated fibroids about 3 cm. in diameter. The whole mass, including fundus tubes and ovaries had undergone early gangrene. On cross section the tumor tissue was extremely edematous and contained many cystic spaces filled with lymph. Microscopically sections from every portion of the specimen showed all stages of degeneration from hyalinization to extensive hemorrhagic necrosis. The cervical canal was still patent and filled with mucus.

BIBLIOGRAPHY

The first case report of axis torsion seems to have been made by Times of England in 1861 in which he described torsion complicating a pregnancy. However, as the torsion seems to have been a minor factor in this observation most writers give credit for the first report of a true case of axis torsion in a fibromatous uterus to Virchow, who in 1863 described this complication in an autopsy on a woman sixty-two years old who had died of pneumonia. Since that date one finds in the foreign literature a gradually increasing number of case reports and from time to time an occasional detailed study in thesis form of this subject by a few careful observers.

No attempt will be made in the bibliography of the present paper to credit the author of each case report but the writers of the more important theses have as far as possible been included. Concerning the latter one may draw attention especially to the excellent observations of Schultze in 1898, Ferroni in 1899, Lepage and Mouchette in 1906, Girod in 1908, Piquand and Lemeland in 1909, Vautrin in 1910, Lhez in 1911, and Hitzanides in 1926.

An accurate estimate of the total reported cases of axis torsion of the fibromatous uterus is impossible without tracing out each individual report, as even in the exhaustive papers of approximately the same dates the estimated totals differ widely. These discrepancies may be explained by the fact that some authors exclude cases when pregnancy is an associated factor while others include all types of axis torsion. Piquand in 1909 collected 84 cases, 70 having occurred independent of and 14 associated with pregnancy. Hitzanides writing seventeen years later in 1926 reports a total of only 85 cases which apparently do not include any torsions associated with pregnancy.

Inasmuch as a brief survey of the literature at the present time reveals approximately 49 additional cases either not included in or reported since Piquand's original article one may assume that at least 133 cases of axis torsion of the fibromatous uterus have been reported to date. The reports of these additional cases have been carefully investigated to avoid duplication, and their salient facts are analyzed at the end of this article. They have been reported chronologically as follows by: 1904, Erdmann; 1905, Cameron; 1909, Connell, Fortun, Griffith, Jaschke, and Uteau and Baux; 1910, Olow (2 cases), Tehohadtitch (2 cases), Vautrin (2 cases); 1911, Bland-Sutton, Jacobs, Lhez (2 cases), Meriel; 1912, Bucura, Dartigues, Kynoch, Secheyron; 1913, Poth; 1914, Ruppert; 1921, Dieulafe (2 cases), Malcolm, Vautrin (2 cases), Wigand; 1922, Whitehouse; 1923, Bernarbeig, Dambrine, Delepine; 1925, Dieulafe (2 cases), Jerlove, Lindig; 1926, Auvray, Didier, Enriquez and Boreo, Gordon-Watson, Hitzanides (2 cases), Massachu-

setts General Hospital Reports (Cabot's Clinic), Pouliquen, Walker; and 1927, Chauvenet. All of these cases are from the foreign literature except that of Erdmann and that shown at Cabot's Clinic in 1926.

ETIOLOGY

Age.—Axis torsion of the uterus occurs much more frequently in women over forty years of age. Piquand records 45 cases in which the age is known noting that 32 of these women were over forty years at the time of the torsion. In the additional 49 cases investigated in this article the age has been recorded in 41, of which 32 were over forty years. Naturally where torsion complicates pregnancy the age incidence is more often below forty but occasionally torsion not associated with pregnancy has also been noted in younger women. Such cases have been reported by Schultze and Löhlein at twenty-five years, Freund at twenty-one years, and the youngest case is noted by Woertz at nineteen years. The oldest cases are those of Bland-Sutton, Griffith, and Semmelink at seventy years.

Pregnancy.—Pregnancy does not seem to be an important etiologic factor in causing torsion in the fibromatous uterus. Of Piquand's 84 cases only 14 occurred in the gravid uterus, of which 11 occurred during the third and fourth month, 2 in the sixth month, and one in the seventh month of gestation. In no case is it recorded during the puerperium. Likewise the number of pregnancies seems to have only slight bearing upon the accident of axis torsion. Piquand has collected 44 cases with complete history, of which 12 were virgins, 8 in nulliparae, while 24 had had one or more children. Of these 24 there were 8 para-1, 6 para-2, 4 para-3, 2 para-4, 2 para-5, 1 para-6, and 1 para-7. Most authors agree that pregnancy by relaxing the abdominal wall and softening the uterine musculature may have some effect on the incidence of axis torsion but add that it is not one of the important predisposing causes. One notes that the literature of veterinary medicine reveals abundant examples particularly in the cow, of axis torsion of the uterus during pregnancy.

Size and Site of Development of the Tumor.—The size and weight of the tumor appear to have a direct effect upon the incidence of torsion of the uterus, as the great majority of cases reported show specimens weighing at least 2 kg. or more. Torsion has occurred in uteri containing tumors as small as 1.6 gm. (deGouillioud) and 1.7 gm. (Demantke), but these are rare, the average corresponding more nearly to that of Küstner which weighed 5 kg. Others have been reported as 7 kg. (Ivanoff), 13 pounds (Meridith), 10 kg. (Stratz), 11 kg. (Faure), and 15 kg. (Piccini). As the growing tumor approaches the average weight reported in these cases, it necessarily rises out of the pelvis into the abdominal cavity in which situation it may more easily twist upon its long axis. Likewise the upward traction force of the

rising tumor is exerted for the most part upon the uterine isthmus which is drawn out and much attenuated thus rendering it less resistant to torsion.

The situation and type of tumor also have a direct bearing upon torsion. These tumors are usually classed as pedunculated or sessile (interstitial) in type. The pedunculated tumors are situated most often away from the midline of the uterus, and torsion of their pedicles is less often transmitted to the uterus itself. This is not true if the pedicle happens to be attached near the midline of the fundus, for in this position the twist on the pedicle is more readily imparted to the fundus beneath it. Thus Piquand notes that in 22 cases where axis torsion of the uterus was caused by the twist of pedunculated fibroids, in 19 the pedicle was attached at or near the midline.

On the other hand the interstitial or sessile tumors are more likely to cause torsion if they are situated away from the midline near one or the other cornu. Here the leverage force of the eccentrically placed tumor seems to increase the likelihood of torsion. In 69 of Piquand's cases torsion resulted from the pedunculated fibroids in 32 and from interstitial fibroids in 37. A few cases have been noted of double torsion, that is, torsion of a pedunculated fibroid and a coexisting uterine torsion (Bantock, Johannowsky, Schwartz and Ferry).

Causes of Torsion.—A satisfactory explanation of the mechanism of torsion in either cysts or fibroids has not been evolved. Likewise in axis torsion of the uterus, while one can recognize certain predisposing factors, still the true exciting force responsible for initiating the rotation has never been clearly described.

As has already been stated, a tumor growing and increasing in weight, lying free in the abdominal cavity, if pedunculated and attached near the midline of the fundus or if sessile and placed eccentrically causing unequal weight to one side or another, and especially if the uterine isthmus has been stretched and thinned out by the upward pull—a tumor with such characteristics will unquestionably be more easily rotated, but the forces which cause this rotation are obscure.

Some authors stress the fact that the normal growing uterus of pregnancy is frequently somewhat dextrorotated and feel that the same conditions exist for the growing fibromatous uterus. Others (Piquand and Vautrin) point out that the right lumbosacral fossa is empty while the left is occupied by the sigmoid colon and rectum and attribute the tendency toward dextrorotation in the majority of cases to the fact that as the fibroid uterus rises it falls toward the empty right fossa and that such movement is encouraged by the repeated shocks of the peristaltic motion of the sigmoid in the left fossa. They add that this offers the best explanation for the dextrorotation in the slow or chronic

form of torsion and that, once initiated, the weight of the tumor and the resisting force of the abdominal wall will continue the rotation. In acute cases they feel the same conditions ensue but that the initiating force is more often some type of external violence or sudden muscular effort. The usual tendency toward dextrorotation may thus be suddenly increased; or, on the other hand, if the force acts in the opposite direction, this tendency may be so completely overcome as to result in a torsion from right to left. Once any given acute torsion is established, the intraperitoneal reaction will cause sufficient abdominal wall spasm to maintain it.

Then also if adnexal complications such as ovarian cyst or tubal inflammation exist, these may even be factors, especially if unilateral, which determine the direction of the rotation, particularly in the slow and more chronic form.

PATHOLOGY

In general the pathologic changes in the pedicle, the fibroid and uterus, the adnexae, and the surrounding organs are much the same whether these changes result from the acute or chronic form of torsion, the essential difference being only that of the degree of the circulatory involvement to the above parts.

The Pedicle.—Torsion occurs as a rule at the level of the elongated and thinned out isthmus. Stratz, Lannelongue and Vitrac have reported cases in which the torsion was produced with the uterine body as a pedicle, but such instances are rare exceptions. The direction of rotation is usually from left to right, and as has been stated the explanation of this phenomenon is not fully understood. Piquand notes that only 13 times in 84 cases has torsion been observed from right to left. The degree of torsion varies from 90 to 360 with a few exceptional cases reported by Micholitsch, by Wertheim, and by Homans of twists approximating a turn and a half, and others by Friedel-Pick, Schultze, Küstner, and Polak who found slightly more than two complete turns. As a rule, however, the restraining broad ligaments do not permit a rotation of more than 300 degrees, in fact the average case approximates 180 degrees. The obliteration of the uterine canal within the pedicle at the level of the isthmus varies somewhat with the degree of the torsion and the length of time that the twist has existed. In practically all instances at this point there is a mechanical blockage of sufficient tightness to prevent an attempt to pass a sound into the uterine cavity. In acute cases which are treated early, detorsion will leave the cervical canal normally patent. On the other hand in chronic cases obliteration due to pathologic changes within the pedicle itself vary from slight fibrosis to a complete severance of continuity, the upper cervix existing only as a thin fibrotic cord (Faure

and Vautrin). The extent of such an obliteration depends directly upon the length of time the torsion has existed and not upon the extreme degree of rotation.

The Fibroid.—In torsion cases the offending tumor, especially when pedunculated and often when sessile, is of the single variety though multiple smaller tumors may coexist. Extensive venous stasis with only partial arterial obliteration usually causes marked edema of the peritoneal covering of the tumor giving it a thickened, violaceous appearance bordering on early gangrene. The muscular and fibrous elements of the tumor are widely separated by lymphatic infiltration so that many cystic spaces form within it, the larger ones often containing a half liter of serous or serosanguineous exudate. These changes, while much more common in the acute torsions, do occur to a lesser degree even in the slow or chronic forms of rotation. In the latter, however, the establishment of collateral circulation often prevents extensive cystic degeneration. Advanced stages of gangrene rarely occur even in the acute form for the arterial supply is practically never completely destroyed.

The Uterus.—Changes within the uterus depend chiefly upon the age of the patient and upon the degree of obliteration of the uterine canal. In acute cases one finds only the circulatory changes within the muscle wall and mucosa, but in the chronic cases where rotation has been gradual and of long duration hematometra and even pyometra may result if the patient is within the menstrual age. In chronic elderly cases there are varying degrees of fibrosis of the uterine wall and often a fibrotic degeneration of the atrophied endometrium.

The Adnexa.—The tubes and ovaries are usually displaced, the left adnexa commonly resting behind the symphysis and the right one within the hollow of the sacrum. In acute torsions they are markedly swollen, often ecchymotic, and the tubes are frequently drawn out to twice their usual length. In chronic cases the ovaries undergo marked cystic degeneration with considerable surrounding peritoneal reaction causing sufficient exudate to gradually form very dense adhesions, while the tubes may become closed resulting in hemato- and hydrosalpinges.

The Bladder and Ureters.—As the growing tumor pulls the uterus upward into the abdominal cavity, the bladder is frequently greatly displaced, and torsion may result in considerable compression with edema of its walls. The ureters may be displaced and even obstructed (Dieulafe reports such a case complicated by hydronephrosis) but such accidents are extremely rare.

The Cardinal Vessels.—Torsion even in the region of the isthmus seldom completely obliterates the uterine arteries, for their fascial coverings are sufficiently independent of the cervical tissue that they

do not as a rule undergo the same degree of twist. Likewise the ovarian arteries in the infundibulopelvic ligaments are only partially blocked. The principal circulatory change is seen in the venous plexuses of the broad ligaments which are tremendously hypertrophied and surrounded by intraligamentary pools of serous exudate.

The Surrounding Structures.—The omentum, small and large intestine, and the parietal peritoneum are frequently involved in chronic cases. Dense adhesions gradually develop between these structures and the main mass of the tumor or adnexae, and occasionally considerable collateral circulation is set up through these new attachments, thus seriously complicating the operative procedure. The early establishment of these adhesions is regarded as the chief obstacle to a spontaneous detorsion.

SYMPTOMS AND SIGNS

The clinical symptoms noted in axis torsion of the uterus roughly fall into two groups depending upon whether the torsion is acute and sudden or slow and progressive.

In acute torsion the onset is sudden and severe, the patient frequently being affected during work or awakened at night without any prodromal manifestations. This suddenness of onset is comparable to that of ruptured ectopic pregnancy, the pedicle twists of ovarian cysts, or to strangulated hernia.

The pain in the lower abdomen is intense and soon becomes generalized producing pallor and at times syncope. The diaphragm is immobilized and breathing becomes rapid and shallow, while the pulse goes up to 110 or 130, the temperature in most cases remaining very little above normal. Reflexly vomiting and hiccough occur, and the former may vary from bilious to fecal in character. Usually in a few hours these symptoms become much less acute, and the patient remains comparatively calm. Later there may again be a gradual increase in the above symptoms with even some rise in temperature as absorption from the more or less gangrenous tissue ensues.

During the period of calm certain physical signs may be elicited which will aid in making a diagnosis. The fibroid tumor may usually be felt through the abdominal wall, and bimanual examination shows that it is closely associated with the uterus. Motion of this mass is extremely painful while the fornices and culdesac are empty and free of induration. The vaginal vault and cervix are usually pulled up to considerable height so that the examining finger may have difficulty in reaching them. The impossibility of passing a sound or catheter into the uterine cavity is a diagnostic sign of the utmost importance and has been stressed by all writers on this subject. In acute cases the patient's condition is so grave and the indication for operative interference is so clear that few surgeons will undertake such a diag-

nostic procedure; however, in the cases of chronic torsion this sign is of great value and should be employed if the diagnosis is to be verified.

In slow or chronic torsion the presence or absence of symptoms and signs depends upon the method in which this complication occurs. In general, chronic torsion is established either by a gradual and insidious rotation, clinically free of symptoms and often unsuspected before operation, or by a succession of more sudden twists resulting in subacute attacks with free intervals of varying length between. This latter type of chronic torsion often ends in a violent attack of the acute form. In fact from the histories obtained in most cases it is generally agreed that the latter syndrome is the one most commonly observed. The interval between such subacute crises is usually two or three months, and three or four years may elapse before the symptoms of an attack will be severe enough to bring the patient to the surgeon. During such a period of time other symptoms may develop from the adhesions formed to surrounding structures especially the intestines.

If the patient is within the menstrual age and the cervical canal is partially obstructed, disturbances of menstrual flow and dysmenorrhea may develop; or again, if the canal is blocked, the symptoms of hematometra or even pyometra may appear. It is in such cases that catheterization of the uterine cavity will give positive information in establishing a diagnosis.

Frequently the displacement of the bladder so alters its capacity and function that symptoms of urinary distress are noted. Here again both catheterization and x-ray will aid in recognizing such a displacement.

DIFFERENTIAL DIAGNOSIS

The diagnosis of axis torsion of the fibromatous uterus has seldom been made before operation. It is usually confused with twisted ovarian cyst or ectopic pregnancy and occasionally with adnexal disease, appendicitis, and intestinal obstruction. Differentiation between torsion of the uterus and of a cyst is most difficult as the physical symptoms and signs may be identical. Here again catheterization of the uterine cavity is a great aid in all cases while the suppression of menstruation may prove a valuable point in the younger women. On the other hand such amenorrhea has, in some instances, led to the diagnosis of uterine pregnancy. The presence of the large tumor with the point of maximum tenderness over it, rather than to one side or in the flank, along with the absence of signs of blood or exudate in the fornices and culdesac, aid in eliminating ectopic, salpingitis, or appendicitis. The gradual cessation of vomiting within a comparatively short period of time, along with the success of colonic irrigation and similar treatment will soon indicate the absence of a true intestinal obstruction.

Prognosis.—It is quite possible that some few cases of uterine torsion may undergo spontaneous reduction but such an outcome is exceedingly rare. On the other hand an occasional case of slow insidious torsion may through its adhesions develop sufficient collateral circulation to prevent gangrene, but at the same time these tumors often undergo fibrotic degeneration and eventually become calcified. Such instances have been reported by Vercoutre, Goullioud, and Ferrand.

For the most part, however, in all types of uterine torsion left untreated the prognosis is exceedingly grave due to the rapid development of circulatory complications. In Piquand's series of 84 cases, 8 were untreated and of these 6 died, a mortality of approximately 75 per cent.

On the other hand the prognosis after operative interference is much more favorable. In acute cases with early operation just after recovery from the initial shock of onset the mortality is practically that for ordinary fibroid hysterectomy in elderly women. However, any protracted delay of operation for a week or ten days greatly decreases the chances of a favorable outcome because of the extent of the gangrene, sepsis, and peritoneal involvement. In chronic cases without extensive adhesions operation offers comparatively little risk, but at times these torsions of long duration may necessitate extremely difficult dissection and the mortality in such instances is slightly higher.

Piquand reports 76 cases of fibromatous uterine torsion with operative interference, in 13 of which pregnancy coexisted. Of the 63 non-pregnant cases 7 died, and of the 13 pregnant cases only one ended fatally, thus giving 8 deaths in 76 operatives, or a mortality of 10.5 per cent. The marked difference in the results in the gravid and non-gravid groups may be explained by the fact that the latter patients are for the most part well over fifty years of age. Barrozi reports 41 cases with an operative mortality of 7 per cent. Such figures markedly emphasize the seriousness of these uterine accidents, but when one compares them with the almost inevitable end-result if untreated, operative interference then becomes not only a matter of choice but of necessity.

TREATMENT

In a few instances (Rokitansky and Vercoutre) attempts have been made to manually reduce axis torsions of the uterus without operation but such efforts have seldom been successful. Such a procedure, even if possible, is strongly deprecated by all writers, for the chance of subsequent acute torsion is almost inevitable. The presence alone of the usually large fibroid in these patients warrants operation so that when axis torsion occurs such procedure may be said to be doubly indicated.

The type of operation employed varies with certain circumstances. Factors which influence the decision as to procedure are the age and

condition of the patient, the extent of the circulatory disturbance in the organs involved, and the presence or absence of an associated pregnancy. The most advantageous time for operation is generally conceded to be during the period of calm and improvement, which, in acute torsions, follows the shock of the initial onset; while in the more chronic and insidious twists operation is seldom imperative, in fact these forms of rotation are frequently unrecognized before laparotomy.

In young women with comparatively little tissue damage of the uterus and adnexae, myomectomy is the operation of choice, provided the tumor is pedunculated or, if subserous, easy of access. In these cases the uterus, relieved of its predisposing factor toward torsion, does not tend to rotate subsequently. However, if such an outcome is regarded likely it may be avoided by ligament suspension as advocated by Holst. Piquand notes 18 instances of myomectomy for uterine torsion caused by fibroids with no deaths. On the other hand even in young women the general state of the patient, the location of the tumor, and the damage to the uterus are often sufficient to demand hysterectomy.

In the acute torsions of elderly women and in the chronic torsions of all ages hysterectomy is usually done. Near or after the menopause indication for preserving the uterus no longer exists, while in the chronic cases the presence of organized adhesions around the tumor and uterus, as well as the chronic degenerative changes in the adnexae, make complete extirpation advisable.

In acute cases most operators prefer the subtotal or supravaginal hysterectomy, as these patients are usually gravely ill and such procedure offers an easy, rapid method of removal with the least possible additional trauma. After manual reduction of the torsion this operation is accomplished in the usual manner. In spite of the anatomic distortion the cardinal vessels are easily identified and their hemastasis offers no difficulty. Control of bleeding from the tremendously hypertrophied collateral venous plexuses within the broad ligaments may cause some concern, and careful ligation of these vessels well beyond the area of any thrombosis is strongly advised. Micheli reports one death from postoperative hemorrhage due to the loosening of a ligature on one of these broad ligament vessels. The cervix as a rule is markedly drawn out and thinned in the region of the isthmus and extirpation at this level is an easy matter. Total, or complete, hysterectomy may be done if the need of pelvic drainage warrants this additional procedure.

In chronic cases supravaginal or complete hysterectomy is recommended. While the general condition of these patients is less alarming, the operative procedure may often be more difficult due to organized adhesions, atypical collateral circulation, and coexisting adnexal complications. Here the advisability of complete removal of

the cervix depends upon the ease with which this may be accomplished, the necessity of drainage and upon the presence of cystic disease within its tissues.

Piquand reports 68 cases operated upon for axial torsion of the fibromatous uterus, of which 18 had myomectomy, 42 had supravaginal hysterectomy, and 8 had complete hysterectomy. In this series there were 60 recoveries and 8 deaths.

Treatment in Pregnancy.—In cases where axis torsion occurs in the pregnant fibroid uterus, the procedure varies with the age of the pregnancy. As this accident happens most frequently in the third and fourth months of gestation, laparotomy with careful myomectomy is usually practiced. According to Piquand 5 of such cases are reported by LePage, Thorn, Spaeth, Bland-Sutton, and Bourcart; in one of which (Thorn) a large subserous fibroid was removed, and in all five the pregnancy continued without interruption. When nearer term torsion may be of the slower variety and may permit of sufficient conservatism and delay to allow the patient to have a spontaneous labor; but, when more acute and the condition of both mother and baby demand interference, induction of labor with subsequent hysterectomy has been done, Dickinson some years ago having reported a successful case with such procedure. More recently, however, under similar conditions most writers agree that cesarean section with hysterectomy is the method of choice.

An analysis of the 49 case reports found in the literature since Piquand's complete article in 1909 follows:

The age was noted in 41, of which 32 were over and 9 under forty years. Obstetric history was given in 35, of which 23 had never conceived and 12 had had one or more children. Of the latter in only 3 cases did torsion occur during pregnancy. Menstrual history was mentioned in 37 showing that 15 had already had menopause and 22 were still menstruating, of which 10 experienced menorrhagia and 12 were free of any irregularity.

The size of the tumor was reported in 34, and in 32 the specimen weighed over 2 kg., the largest weighing 12 kg. The type of tumor was described in 39, of which 35 were sessile and 4 pedunculated; while in 31 the tumor was single and in 8 multiple. Reports were not sufficiently detailed to obtain accurate data on the site of implantation.

The direction of torsion was noted in 40, of which 32 were left to right and 8 right to left. In 39 the least degree of torsion was 45 and the greatest 450, with an average twist of 195. The patency of the cervical canal was indicated in 9 only, of which 5 showed blocking and 2 fibrotic obliteration while 2 remained patent. In 2 cases hematometra was encountered.

The type of case was recorded in 41, of which 30 were acute and 11 chronic. Of 33 cases the preoperative diagnosis was fibroid in 23.

ovarian cyst with twisted pedicle in 7, torsion of pedunculated fibroid in 1, while in only 2 cases was axis torsion suspected. Of the 40 operative procedures given, 34 had supravaginal hysterectomy, 3 complete hysterectomy, and 3 myomectomy. The end-result was definitely stated in 41 cases, all of which recovered.

BIBLIOGRAPHY

- Auvray*: Bull. et mem. Soc. nat. de chir. 52: 542, 1926. *Barsotti*: Ginecologia, Firenze 9: 721, 1912. *Barozzi*: La Gynécologie 9: 481, 1904. *Bucura*: Wien klin. Wehnschr. 25: 621, 1912. *Bernard*: Bull. Soc. d'obst. et de gynéc. 12: 448, 1923. *Bland-Sutton*: Lancet 2: 1132, 1911. *Connell*: J. Obs. and Gynec. Brit. Emp. 16: 184, 1909. *Chauvenet*: J. de méd. de Bordeaux 104: 106, 1927; and 103: 211, 1926. *Cameron*: Brit. M. J. 2: 712, 1905. *Dartigues*: Paris chir. 4: 129, 1912. *Dieulafe*: Bull. Soc. d'obst. et de gynéc. 12: 591, 1923; and 15: 392, 1926. *Didier*: Bull. et mem. Soc. nat. de chir. 52: 724, 1926; and Gynécologie 25: 611, 1926. *Delepine*: Bull. Soc. d'obst. et de gynéc. 12: 239, 1923. *Dambrin*: Bull. Soc. d'obst. et de gynéc. 12: 448, 1923. *Dickinson*: Amer. J. Obst. 49: 544, 1904. *Erdmann*: Ann. Surg. 39: 817, 1904. *Enriquez and Boreo*: Semana méd. 33: 1379, 1784, 1926. *Faure*: Bull. et mem. Soc. de chir. 29: 515, 1903. *Ferroni*: Ann. di obstet. p. 342, 1899. *Freund*: Ztschr. f. Geburtsh. und Gynäk. 17: 147, 1889. *Ferry*: Bull. et mem. Soc. d'anthrop. de Paris 79: 426, 1904. *Fortun*: Rev. méd. cubana 15: 65, 1909. *Girod*: Thèse Paris, 1908; and Gaz. d'Hop. 84: 207, 1911. *Goullioud*: Bull. Soc. de chir. de Lyon 7: 140, 1904. *Griffith*: Proc. Roy. Soc. Med. 2: 187, 1909-10. *Gordon and Watson*: J. Obst. & Gynec. Brit. Emp. 33: 419, 1926. *Homans*: Am. J. Obst. 25: 339, 1892. *Hitzanides*: Gynec. et Obst. 13: 103, 1926. *Johannowsky*: Monatschr. f. Geburtsh. u. Gynäk. 8: 358, 1898. *Jacobs*: Bull. Soc. Belge de gynéc. et obst. Brux. 22: 83, 1911. *Jaschke*: Ztschr. f. Geburtsh. und Gynäk. 65: 653, 1909. *Jerlov*: Acta obst. et gynéc. Scandina. 4: 197, 1925. *Küstner*: Centralbl. f. Gynäk. 44, 1890; and Handb. der Gynäk. 1907. *Kynoch*: Tr. Edinburgh Obst. Soc. 37: 279, 1911-12. *Löhlein*: Gynäk. Tagesfragen 4: 8, 1895; and Deutsche med. Wehnschr. 23: 243, 1897. *LePage*: Ann. de Gynec. et Obst., Feb., 1906. *Lhez*: Thèse Toulouse, 1911. *Lindig*: Centralbl. f. Gynäk. 49: 2876, 1925. *Micholitsch*: Ztschr. f. Geburtsh. u. Gynäk. 40: 276, 1899. *Meriel*: Compt. rend. Soc. d'Obst. de Gynec. et de Pédiat. Paris. 13: 257, 1911. *Malcolm*: J. Obst. & Gynec. Brit. Emp. 28: 144, 1921. *Massachusetts General Hospital Reports*: Boston M. & S. J. 194: 999, 1926. *Olow*: Monatschr. f. Geb. und Gyn., Berlin 32: 53, 1910. *Piquand et Lemeland*: Rev. de Gynec. et de Chir. Abd. 3: 377, 1909, with bibliography to date. *Pick*: Prag. Med. Wehnschr., 219, 1891. *Poth*: Centralbl. f. Chir. Leipzig 37: 1147, 1913. *Polak, O.*: Wien. klin. Rundschau. 12: 685, 1898. *Pouliquen*: Bull. et mem. Soc. nat. de chir. 52: 662, 1926. *Ruppert*: Wien. klin. Wehnschr. 27: 271, 1914. *Schultze*: Ztschr. f. Geburtsh. und Gynäk. 38: 157, 1898; Gynäk. 152: 505, 1906. *Semmelink*: Beitr. z. Geburtsh. und Gynäk. 5: 352, 1901. *Stratz*: Ztschr. f. Geburtsh. und Gynäk. 48: 430, 1902. *Schwartz et Mermet*: Soc. Anat. omique, June to Dec., 1896. *Secheyron*: Arch. Méd. de Toulouse 19: 49, 1912. *Tchohadtitch*: Thèse Paris, 1910. *Times*: Tr. London Obst. Soc., 1861. *Uteau et Baux*: Toulouse Med. 11: 2s, 167, 1909. *Vautrin*: Rev. de Gynec. et de Chir. Abd. 15: 193, 1910, with bibliography to date. *Virchow*: Die Krankhaften Geschwülste 3: 161, 1863. *Vercoutre*: Mem. de Méd. Chir. et Pharm. Militaire 35: 1879. *Woertz*: Monatschr. f. Geburtsh. und Gynäk. 12: 68, 1900. *Wertheim*: Jahrb. d. Wien. K. K. Krankenanst., Wien. 7: part 2, 343, 1900. *Wigand*: Deutsche tierärztl. Wehnschr. 29: 106, 1921. *Whitehouse*: J. Obst. & Gynec. Brit. Emp. 29: 320, 1922. *Walker*: J. Obst. & Gynec. Brit. Emp. 33: 424, 1926.

114 EAST FIFTY-FOURTH STREET.

(For discussion, see page 413.)

STERILITY, WITH SPECIAL REFERENCE TO THE SPERMATOOZON

BY LYMAN W. MASON, B.A., M.D., DENVER, COLORADO

ONE of the most difficult and unsatisfactory classes of cases one is called upon to treat is sterility, where there is no obvious cause for the situation. The uterus is found to be in good position, there is no demonstrable pelvic pathology, and the menstrual history is normal. The husband's semen is examined and motile sperms are found, and yet, after several years, there have been no pregnancies. This class of cases is dealt with in the following paper.

It was formerly believed that the husband had been given sufficient attention if, or when it was found that his semen, usually brought to the office carefully kept warm in a thermos bottle or by some other arrangement, contained live spermatozoa in more or less goodly numbers. It is now beginning to be realized that a proper investigation of the possible responsibility of the husband in any given case of obscure sterility entails much more than this.

For some time I have been engaged in a study of spermatozoa, in an attempt to find answers to a number of questions which I never could find answered to my satisfaction, if at all, in textbooks on gynecology or urology, and only occasionally in a vague and general manner in special treatises on sterility. Among these are: What constitutes, morphologically, a normal human spermatozoon? How long should a normal sperm live, and how should its vitality be tested? What effect does the acidity of the vagina and acute and chronic infections, in both male and female, have on it? In cases of obvious poor quality of sperm, is the fault inherent in the spermatozoa, or have they been injured by their temporary habitat in "hostile secretions"?

While the material for this paper was being collected, two interesting articles have appeared, which give promise of furnishing some definite information regarding the possible answer in some cases of unfruitful marriages, in which both the husband and wife have been found apparently normal. Both of these articles have had to do with the male factor in the equation, and further reference will be made to them in this report.

The first specimens of semen and spermatozoa which were examined were from husbands of women who came because of failure to become pregnant, through marriages ranging from one and one-half to twelve years. Later specimens were examined which were obtained from men known to be fertile, having from three to five children. Some of these specimens were brought to the office in condoms, and some were ob-

tained by means of a pipette from the vaginal vault. For purposes of study of morphology, it made no difference.

Fig. 1 shows all the major differences in form which were found in all the specimens. There were innumerable finer variations in forms showing a difference in transverse diameter, ranging from that shown in "b," to that of "a," "g," or "i." These forms were observed and drawn as seen, several smears being made from each semen specimen, special care being taken in spreading, as it was found that rough handling broke many heads from the tails. I believe that this accounts for the forms "o" and "q," represented by Moench in his paper as being abnormal forms, since the one appears to be a normal head and the other a normal tail. As stated above, from the same semen specimen,

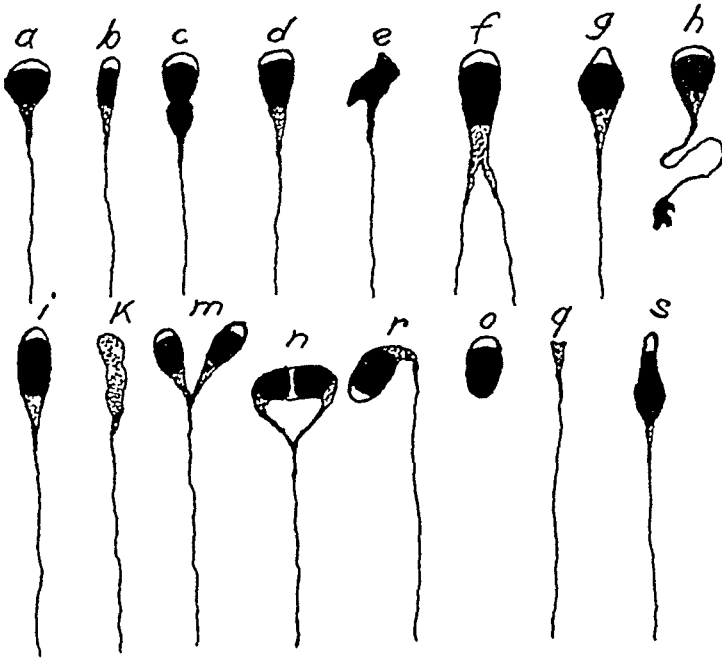


Fig. 1.—Tails shown relatively much shortened, except *h*.

it was possible to produce, on successive smears, an increasing number of these forms by increased rough manipulation of the smears in spreading. In the reported discussion of Moench's paper, Rubin voiced the belief that the double headed and double tailed forms were optical illusions or artefacts, and said that he had examined thousands of spermatozoa without ever having seen such forms. I agree absolutely with Moench that these are actual forms. In my own observations, I never saw the double headed forms except in two specimens, and in these two I always found them. All of these forms were seen in the unstained fluid preparations, and their movements studied, and were then examined minutely in stained preparations. Any good bistaining method suffices for satisfactory examination. A somewhat better smear is obtained if the mucus is removed from the slide before staining.

I am inclined to believe that forms such as "e" are artefacts, and caused by the flame in fixing. Forms such as "f," "h," "m" and "n" are not numerous; "r," in which the head is more or less sharply bent at the neck, is frequently common in certain specimens. The most frequent variation is in the lengths of the heads, and in their diameters. The structure of the spermatozoon is more complicated than is shown in the figures, especially the details in the connecting piece between the head and the tail. To show these, very high magnification and special staining methods are necessary, which are not feasible in routine clinical work, and which were not considered necessary for the purposes of this study.

In each specimen, from stained smears, with the high dry objective, and 10x eyepiece, 500 consecutive sperms were observed, and the number of grossly abnormal forms, without regard to type, were counted. The average of these forms in the specimens from sterile marriages was somewhat higher than those counted from specimens from husbands of fertile marriages, being 9 per cent and 5 per cent respectively.

The next step consisted in measurements of the lengths and diameters of the heads, and the lengths of the tails, of 250 consecutive sperms. The tail measurements showed nothing remarkable, as the ratio of tail length to head length ran pretty uniformly around 11:1. These measurements were made on forms adhering more or less closely to the recognized "normal" sperm, that is, those with ellipsoid or ovoid heads, double headed or double tailed forms, as well as other "freak" forms, being omitted. It was found that some specimens showed a greater variation in lengths and diameters of the heads than others. When these microscopic data were correlated with the clinical data in the particular sterility problem being studied, it was found that the greatest variation occurred in the specimens from husbands whose wives showed the least cause for failure to conceive. This point will be discussed more in detail below.

The shortest head length found in any of the sperms measured was 2.5 microns, and the longest 8 microns. The shortest diameter was 1 micron, and the greatest 4.5 microns. These were combined to give heads shaped from almost or quite spherical to ellipsoids with head length several times the diameter.

In all specimens, regardless of what percentage of grossly abnormal forms was present, or how much variation was shown in measurements of the remaining forms, the definite majority was always 5×3 microns in size, and of regular contour, as "i" in Fig. 1, with tails approximately 55 microns long, the heads being almost filled with dense nuclear material, except for an area of cytoplasm from 1.5 to 2 microns at the proximal end. This, I believe, may be taken as the gross morphology of the normal human spermatozoon, and I would apply the terms megalsperm and microsperm to forms larger or smaller than this, re-

spectively. This description is of the appearance "on the flat," in which position they are almost without exception viewed in stained smears. When on edge, they appear as shown by "s," Fig. 1, and this view is obtained readily only when they are observed in motion, with the high power, dry objective. Little variation was ever noted in this plane, but as none was observed so lying in stained smears, no definite measurements were possible. As indicated, variations in size of forms conforming more or less closely to this type are regularly found, the range of variation being greater in some specimens than in others. In many sperms, the nuclear material was stained much lighter than others in the same smear, the sperms otherwise appearing alike. This must represent some difference, but what it may be, I do not know.

Efforts to determine the vitality of the different specimens were now made. At first the patients were instructed to bring the specimens to the office with great care in regard to temperature, the condom being kept in the clothing near the skin, or in a thermos bottle at body temperature. It was soon found that such "hot-house" methods were not necessary. Specimens of sperms were repeatedly kept alive in a test tube, at room temperature, with no precautions except to provide against evaporation, for periods varying from twenty-four to sixty hours. Some specimens showed only a few or no live forms upon arrival, at periods varying from one to three hours after ejaculation. Thinking that perhaps some material in the condoms might be responsible for this condition, the specimens were poured out, and known normal specimens substituted. There was no apparent effect upon these latter specimens. Later, the semen specimens which showed all, or nearly all the sperms dead upon arrival in condoms, were almost invariably found to be in the same condition when removed from the vaginal vault, within the same periods of time after coitus. This would seem to absolve the vaginal vault and its secretions from fault in these cases.

As a result of observations upon the lengths of time that various sperm specimens lived, it was concluded that, roughly, normal sperms will survive in appreciable numbers for at least twenty-fours, under ordinary conditions of temperature, and that to obtain an estimate of sperm vitality, sufficient for clinical purposes, it is not necessary to keep the specimen at a temperature corresponding to that of the body.

By means of a stop watch, the time was measured which was necessary for fresh normal sperms to travel across known distances calibrated on the microscope eyepiece, and the average speed for 250 was found to be approximately 1.8 mm. per minute or about 11 cm. an hour.

Of course, too much importance is not to be attached to such a measurement of motility, since only those forms which swim in a straight line for a sufficient distance can be so measured, and it is evident that the distance which any sperm travels to reach the tube is more than the

actual distance from external os to tube. Also the motility of the sperms diminishes with increase of time after ejaculation. But allowing for these factors, it seems that a minimum of three or four hours is more than ample time for an appreciable number of sperms to reach their destination in the tubes.

Another observation was made in this connection, viz., that when portions of vaginal secretion were added to semen, an immediate stimulation was noted, whereby the motility of the sperms was definitely increased. This stimulation is only transient, and when left in an acid medium, their ultimate lives are shortened, usually by several hours, compared to the controls. This point has a significance which is discussed more in detail below.

Small amounts of semen from specimens containing virile sperms were mixed with much larger amounts of semen in which all, or nearly all, the sperms were found dead. The sperms remained alive as long in these mixtures as in the control tubes of unmixed semen. This would lead one to suspect that some defect inherent in the sperms themselves was responsible for their failure to live, and not some "hostility" of the prostatic or seminal fluids, as is so often given as a cause. If, as seems probable, the morphology of the sperms is an index to their fertility, it would appear reasonable to presume that the same influence which was responsible for the variation in morphology was also responsible for their diminished fertility, or lack of it. The sperms are formed in the testicle, and we cannot conceive that their temporary habitat in secretions of whatever character, before ejaculation, could alter their morphology, making some larger and some smaller, some with two heads or two tails, etc. As normal sperms die, there is no change in their visible forms, whether their motility ceases as a result of age in normal semen, or whether it is caused by chemical or physical agents inimical to their existence.

The factors which so influence the testicle to produce sperms with wide variation in morphology, vitality, and fertility, are unknown. This, of course, constitutes the ultimate problem, as our work is directed to treatment. Much has been said and done recently about diet in this connection. It seems to me that this could be a factor only in the very rare case. At present, at least in this country, our diets are varied enough to contain, presumably, all the vitamins necessary to our well-being. Diet has been well proved to be a factor in fertility and sterility, but the work has been done with chosen and controlled diets, in the laboratory, on animals. Under the same regulated conditions, rickets, beri-beri and scurvy can be produced. Clinically, in adults we see such cases as rarities, and when they are seen, they are far from being in the apparent good health in which we see most of the men and women who come to us because they have no children.

Certain it is that infection of the posterior urethra, prostate and seminal vesicles is not necessarily a bar to male fertility, since we see all too frequently the combination of a first pregnancy and an early female gonorrhea. In this series of experiments, the semen specimen which contained living sperms the longest (over sixty hours), under conditions described above, was from a man who had had gonorrhea eleven years ago, with unilateral epididymitis, and who now shows pus and much mucus in his semen, and who has a chronically inflamed prostate and vesicles. In another case, in which the couple have been married for five years, there is one child four years of age. Since the birth of this child there have been numerous pregnancies ending in spontaneous abortions at periods varying from two to four months. The Wassermann reaction is negative in both man and woman. Examination reveals an enlarged and tender tube on the left side, a badly lacerated cervix, probably dating from the birth of the first child, with a severe chronic infection (gonorrheal) of the cervix, with a profuse mucopurulent discharge. From her history, all of these symptoms, and presumably all of the signs, have been present for over three years. Examination of the husband showed a chronic gonorrhea, with enlarged and boggy prostate, and indurated vesicles on both sides. Obviously there is sufficient trouble here to explain the repeated abortions, but the point I wish to emphasize is that it has not prevented frequent conceptions.

As the semen specimens were examined from time to time, to determine the longevity of the sperms, it was observed that by far the largest percentage of the longest living forms was of those grossly abnormal, and this was much greater than the percentage of those forms present in the smear. Thus in one specimen containing 10 per cent of grossly abnormal forms, at the end of forty-two hours only five sperms were found alive. Of these only three were making progress; two of these were double tailed and one double headed. Both of the other two were megalosperms; they were moving, but making no progress. It would appear that, other factors being equal, those forms having the greatest amount of protoplasm tend to survive longer than those smaller, containing less. If this observation holds in a sufficiently large number of cases, one would be led to believe that it might be an explanation of the observation made by Williams and Savage in cattle. that abortions were more frequent in cows which had been impregnated by bulls whose semen contained a large percentage of abnormal sperms. If these forms are more virile, in a semen generally below par, the chances of such sperms reaching an ovum would be greater, resulting possibly in an abnormal embryo unable to reach maturity. The same may apply to cases of so-called habitual abortions in women.

It was at about this time in my own work that Moench's paper, based in turn upon the work of Williams and Savage on bulls, came to my

attention. This paper contained graphs of sperm head lengths, with possible prognostic value based on such graphs. In a few words, the graphs are obtained by plotting sperm head lengths along the abscissa, and the total number of each length along the ordinate. The graph will therefore be wider at the bottom in cases showing greater variations in sperm head length. Two of these graphs, modeled after those of Moench, are shown in Fig. 2. The first, *A*, shows much less variation than the second, *B*. The first would therefore be considered a much more favorable sperm specimen than the second. The wives in these two cases were studied carefully, and were found to be apparently normal, with the exception that each had quite heavy and tenacious mucus in the cervix, which was thought to be a factor in their inability to become pregnant. Uterine insemination was done in both cases, the semen being injected from the vaginal vault by means of a sterile glass pipette. The wife in the first case missed her next menstrual period,

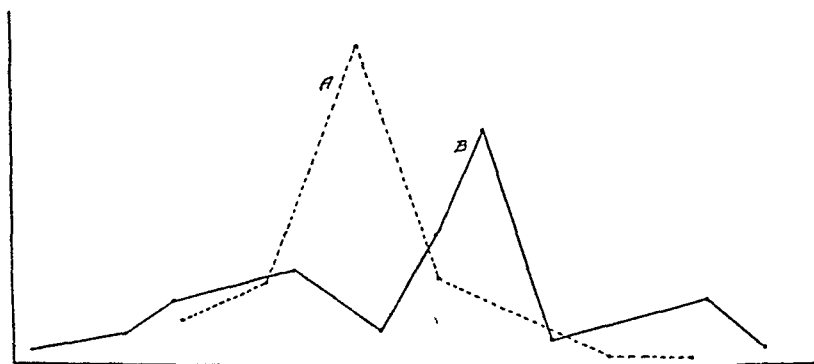


Fig. 2.—Sperm head lengths in microns along horizontal (3x actual for sake of emphasis), and total number of each length along the vertical.

Graphs are not superimposed, since the apex of *A* represents the same sperm head length as the apex of *B*, viz., 5 microns.

and is now normally pregnant. In the second case, nothing has happened, although three inseminations have been done. If such graphs are significant, they will prove a distinct help in fixing possible responsibility in doubtful cases of sterility, and in prognosis. As Moench states, hundreds of cases will have to be studied along this line before any definite rules can be formulated.

Kurzrok and Miller seem to have conclusively demonstrated a ferment or lysin in semen which is specific for cervical mucus. It is apparently absent in some semina. This is an interesting line of investigation, and could well explain some hitherto baffling cases of sterility.

I have been impressed, when removing specimens of semen from the vaginal vault, with the concentration of the sperms in the external os. It seems to be always greater here than in other parts of the vagina, in the "seminal pool," for example. This observation led to a series of experiments wherein a drop of fresh semen was placed in contact with a drop of vaginal material upon a slide, and observed under the micro-

scope. An increased motility of the sperms was noted in the region of the junction of the two drops, as was mentioned above when semen was mixed with vaginal secretion, but in a relatively short time (about ten minutes) all the more active sperms had moved away from the junction to the more alkaline portions of the semen drop. A very few had penetrated into the vaginal droplet, and a few feebly moving ones were found in the region of the junction of the two.

Now, clinically, the semen is always alkaline, the cervical secretion is uniformly alkaline, but the mixture of material found in the vagina and vaginal vault is acid. Positive and negative chemotropism is offered frequently as an explanation of facts observed in plant and animal ecology, and the same thing seems to play a part here. This change in reaction from the vagina to the cervix may serve to direct the sperms to and into the internal os, making the entrance to the canal not so much of a hit or miss affair as one might suppose from watching the multiplicity of directions taken by the sperms observed under the microscope.

The frequent direction to patients, therefore, who complain of sterility, and whose vaginal secretions are found to be acid, to take an alkaline douche just before intercourse, may serve only to place another obstacle in nature's pathway. I have not yet found a vaginal secretion so acid that, when mixed with semen in proportions far greater than those obtaining after intercourse, when dilution by the alkaline semen and increased alkaline cervical secretion has taken place, had any immediate effect upon spermatozoa except to stimulate their motility. Especially in dispensary practice, one is struck by the large number of patients who come for two things; some treatment to stop a profuse cervical discharge, dependent upon a chronic cervicitis, and which is always acid in the vagina, and contraceptive advice. In other words, these patients have a profuse acid vaginal discharge, and they do not complain of sterility. I have not yet found any evidence that there is an "aspiration action" of the human cervix, which is sometimes advanced to explain the entrance of semen into the uterus.

In another series of experiments, semen was placed in conjunction with, and mixed with, specimens of thick cervical mucus, obtained in each case from patients whose complaint was sterility. In no instance did a spermatozoon ever progress farther than a few microns into it. Many of them stuck to the edges of these masses, and were unable to move in any direction, although the movement of the tails was vigorous. These tests were made both with the husband's semen, and with known normal semen.

As a result of these observations, it was concluded that, in those cases where husband and wife are apparently normal, but where conception does not occur, and especially after careful examination of the semen shows it to be up to a normal standard of fertility, that the chief

bar to conception lies in the inability, for one cause or another, of the sperms to pass the barrier of the cervical canal and internal os.

The treatment therefore (and this is not new) is the introduction of the sperms into the uterus by means of a pipette. Needless to say, there should be no pathogenic organisms in the cervix or vault. In doubtful cases, condom specimens of semen may be used. Otherwise the patient is instructed to come to the office as soon after intercourse as possible, but not longer than an hour, when the injection is made directly from the vaginal vault. The injection of such material into the uterus is not without its theoretical dangers, but as yet we have had no accidents. Not more than a few drops of semen or material should be injected, and this gently; it is not the purpose to force it into the tubes, but to deposit it in the uterus. This treatment would also be indicated in those cases seemingly found by Kurzrok and Miller, in which a cervical mucus lysin is absent in the semen.

Here we are confronted again with the much debated question as to when ovulation occurs. Different authorities have placed it from nine to twenty-one days after the beginning of the last menstrual period. Loewe has published an article dealing with the recovery of the female sex hormone from urine, which shows that this hormone, while present to some extent all the time, appears in greatest concentration in the urine eleven days postmenstruation. Gustavson, who with Frank has done much work with the female sex hormone and its extraction, now uses urine exclusively as a source of hormone, since the absence of lipoids, etc., facilitates extraction and the hormone is obtained in more concentrated state than when obtained from the ovary or blood. The urine, then, is evidently a more accurate and sensitive indicator, so to speak, of changes in amount or concentration of this hormone in the body than other available fluids. Since the greatest concentration appears at the eleventh day, ovulation probably occurs then, or possibly shortly before this time. We have used the twelfth day for the first insemination, and if one is unsuccessful, the time may be varied a day or so either way the following month or months.

Naturally, the number of cases which meet the requirements for selection such as outlined will be small. Usually some grosser reason can be found for the sterility. So far, in my own cases falling in the former class, pregnancy has followed insemination in two cases, of two and six years sterility, and has failed in two others after three trials. In one of the latter, failure was predicted because of the failure of the sperms to meet requirements, and the second seemed to be a fair specimen when measured by standards as described above.

Last, but not least, we have assumed that a woman in good general health, whose menstrual history is normal, and whose genital organs show nothing grossly abnormal, secretes normal ova. That this assumption is correct in all cases is doubtful. At present we have no

means of knowing this except when conception occurs. As in other fields, we know very little about the delicate physicochemical reactions and balances concerned in the reproductive processes, and until more of the biologic fundamentals are known, our efforts in many obscure cases of sterility will be gropings in the darkness.

CONCLUSIONS

In some cases of sterility, no apparent abnormality, either in husband or wife, can be found.

Examination of the semen, in obscure cases, should be more exhaustive than is usually made. The percentage of abnormal sperms found in a specimen of semen seems to be an index of the fertility of the individual, and its determination offers an aid in prognosis.

It is possible that too much importance has been ascribed to so-called hostile secretions in the male genital tract in their influence on the sperms.

The acidity of the vagina seems to play a part in directing the sperms into the external os.

Thick tenaceous mucus in the cervical canal offers an effective barrier to the passage of sperms. The cervix and internal os offer the first, and probably the greatest, obstacle to the passage of the sperms to their place of union with the ovum in the tube.

Good general health and a normal menstrual history may not necessarily be assurance of normal ova.

Deposition of the sperms in the uterus by means of a pipette circumvents the barrier of the cervix and internal os, and in selected cases and with proper care in technic seems to be reasonably free from danger.

REFERENCES

- Williams, W. W., and Savage, A.*: Cornell Vet. 15: 353, Oct., 1925. *Moench*: AM. J. OBST. & GYN. 13: 334, March, 1927. *Kurzrok, R., and Miller, E. G., Jr.*: AM. J. OBST. & GYN. 15: 56, Jan., 1928. *Loewe, and Lange*: Klin. Wchnschr. 5: 1038, June, 1926.

620 REPUBLIC BUILDING.

THE RATIO OF UREA NITROGEN TO TOTAL NONPROTEIN NITROGEN IN THE BLOOD IN NORMAL PREGNANCY

BY W. DENIS,* PH.D., E. L. KING, M.D., AND FRANCES BRIGGS, M.Sc.
NEW ORLEANS, LA.

(From the Departments of Bio-Chemistry and of Obstetrics of the School of Medicine, Tulane University)

IN MOST samples of normal blood about 50 per cent of the total non-protein nitrogen is accounted for by the urea nitrogen, although variations of from 35 to 55 per cent have been recorded.¹

During the past decade there have been published the reports of numerous investigations dealing with the chemistry of the blood in pregnancy and incidentally with the problem of the relative concentrations of urea and of nonprotein nitrogen in this condition. The results of these investigations are practically unanimous in the findings regarding the low absolute concentrations of nonprotein nitrogen and of urea in the blood in normal pregnancy and also in the majority of cases of abnormal conditions. But the observations regarding the relative concentrations of these fractions are rather diverse. Thus certain investigators have found that the ratio of urea nitrogen to nonprotein nitrogen in the blood of normal pregnant women is much smaller than in the blood of the nonpregnant individual;² others have found this abnormality only in the blood in eclampsia and other pathologic conditions,³ while on the other hand the results of several investigations are available which would indicate that this ratio is the same in pregnant and in nonpregnant subjects.⁴ The lowered ratio of urea nitrogen to nonprotein nitrogen of the blood in pregnant women (if it exists) is of considerable interest both from the theoretical and from the practical side. The relation of the liver to urea formation has long been stressed by physiologists, while the occurrence of pathologic changes in this organ has been noted at autopsy in a sufficient number of cases of eclampsia to warrant the view that in certain pathologic cases at least, the damage to the liver may be sufficiently severe to give rise to an abnormal concentration of some of the constituents of the blood and perhaps even the urine. On the other hand it is difficult to account for the fact that in normal pregnancies the ratio of urea nitrogen to nonprotein nitrogen should be lower than in the case of nonpregnant individuals. Two theories may be mentioned, the first of which, advanced some years ago by Polin,¹ suggests that the pregnant organism may be extremely susceptible to the toxic effects of certain waste products and in self-defense may be compelled to keep these waste products at a sub-

*Dr. Denis died on January 10, 1929. In her death, scientific medicine, especially in the field of biochemistry, sustained a great loss. (E. L. K.)

normal level; the second that in order to nourish the fetus properly the maternal blood must contain a relatively higher proportion of amino acids and polypeptids than does that of the nonpregnant individual.

In view of the diversity of results which have been obtained by the earlier investigators it has seemed worth while to carry on a relatively extensive series of observations on the ratio of urea nitrogen to total nonprotein nitrogen in women at different stages of pregnancy and also for the first two months postpartum.

In a few cases we have been able to obtain a series of samples of blood from the same women taken at intervals during all or a considerable portion of the period of gestation.

In order to check our analytic methods we have also included in each series of 10 to 15 samples of blood taken from pregnant subjects the blood of one nonpregnant individual either male or female.

TABLE I. UREA NITROGEN, NONPROTEIN NITROGEN AND RATIO OF THE SAME IN 239 SPECIMENS OF BLOOD FROM 162 NORMAL PREGNANT WOMEN

MONTHS PREG- NANT	NUM- BER OF CASES	NONPROTEIN NITROGEN MG. PER 100 C.C. BLOOD			UREA NITROGEN MG. PER 100 C.C. BLOOD			RATIO UREA NITROGEN TO NONPROTEIN NITROGEN PER CENT		
		MAXI- MUM	MINI- MUM	AVER- AGE	MAXI- MUM	MINI- MUM	AVER- AGE	MAXI- MUM	MINI- MUM	AVER- AGE
1	1			24.0			10.0			41.7
2	5	27.2	20.7	23.3	10.4	6.1	8.3	43.5	29.6	35.5
3	9	24.6	19.0	21.8	9.9	5.9	7.5	40.6	25.0	34.3
4	16	26.2	17.5	23.2	8.9	5.0	8.1	42.0	26.0	34.3
5	24	26.0	19.3	22.0	10.0	4.7	7.3	43.5	25.0	33.0
6	31	26.1	18.2	22.3	13.0	5.1	7.4	52.0	22.2	33.4
7	52	27.2	16.7	21.3	11.0	5.0	7.5	45.5	24.2	33.0
8	49	28.5	17.5	21.8	11.7	4.7	6.8	49.5	23.9	32.8
9	47	27.3	17.1	22.1	12.5	4.9	7.2	46.0	22.6	32.6

Our determinations of urea and of nonprotein nitrogen were made by the methods of Folin and Wu.⁵ During the course of the investigation frequent check analyses were run on urea solutions of known concentrations, and during the latter part of the work check analyses were also made by the recently published manometric method of van Slyke.⁶

Our clinical material was obtained from the colored out-patient clinic and colored obstetric wards of the New Orleans Charity Hospital. The samples of blood were all obtained at about the same time in the morning and were brought immediately to the laboratory and analysed at once.

Our observations have extended over a series of 316 samples of blood taken from 162 normal pregnant women from the first to the ninth month of gestation, 55 samples of blood taken from 55 women from eleven hours to five months after delivery, and (as a check on our analytic technic) 14 samples of blood from 14 nonpregnant individuals. The ages of our subjects varied from fourteen to thirty-seven years,

TABLE II. UREA NITROGEN, NONPROTEIN NITROGEN, AND RATIO OF THE SAME IN 55 POSTPARTUM CASES

TIME AFTER DELIVERY (DAYS)	NUMBER OF CASES	NONPROTEIN NITROGEN MG. PER 100 C.C. BLOOD			UREA NITROGEN MG. PER 100 C.C. BLOOD			RATIO UREA TO NONPROTEIN NITROGEN PER CENT		
		MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE	MAXIMUM	MINIMUM	AVERAGE
0.5	1			21.8			6.1			27.9
1	2	31.6	24.5	30.8	9.1	8.0	8.6	32.6	27.9	30.2
2	4	27.9	19.7	24.2	12.2	7.9	9.9	43.5	39.2	40.7
3	4	21.4	20.6	20.8	8.4	6.7	7.7	41.0	32.3	37.4
4	4	30.0	19.8	25.4	12.2	7.5	9.7	48.0	33.6	38.4
5	7	28.6	20.7	23.9	10.6	7.5	8.6	41.1	34.6	39.2
6	1			20.0			6.9			34.5
7	1			24.0			8.5			35.4
8	1			20.4			9.0			44.0
9	1			28.6			13.2			46.0
17	1			22.2			8.3			37.4
21	2	32.4	31.6	32.0	16.6	11.5	14.1	51.1	36.4	43.8
30	9	29.7	23.1	26.3	14.2	9.4	10.9	47.5	34.0	41.6
35	2	27.1	23.8	25.5	11.8	11.5	11.7	43.0	41.5	42.3
42	2	23.8	18.5	21.2	10.5	7.7	9.1	44.3	41.5	42.9
49	2	28.6	25.3	27.0	11.3	9.9	10.6	39.8	39.0	39.4
60	3	26.1	23.7	24.9	11.3	10.5	10.9	42.3	40.2	41.3
90	3	30.4	22.2	25.9	13.9	9.6	11.8	47.6	43.0	44.9
120	4	30.7	21.5	25.5	11.1	9.9	10.4	46.5	34.5	41.4
150	1			32.0			14.3			44.6

the majority being between eighteen and twenty-two years. The number of previous pregnancies recorded ranged from 0 to 8 with a considerable proportion of primiparae.

In the interest of space economy we have refrained from tabulating all our results, but in Table I have presented the maximum, minimum

VARIATION OF THE RATIO UREA NITROGEN: NONPROTEIN NITROGEN DURING PREGNANCY

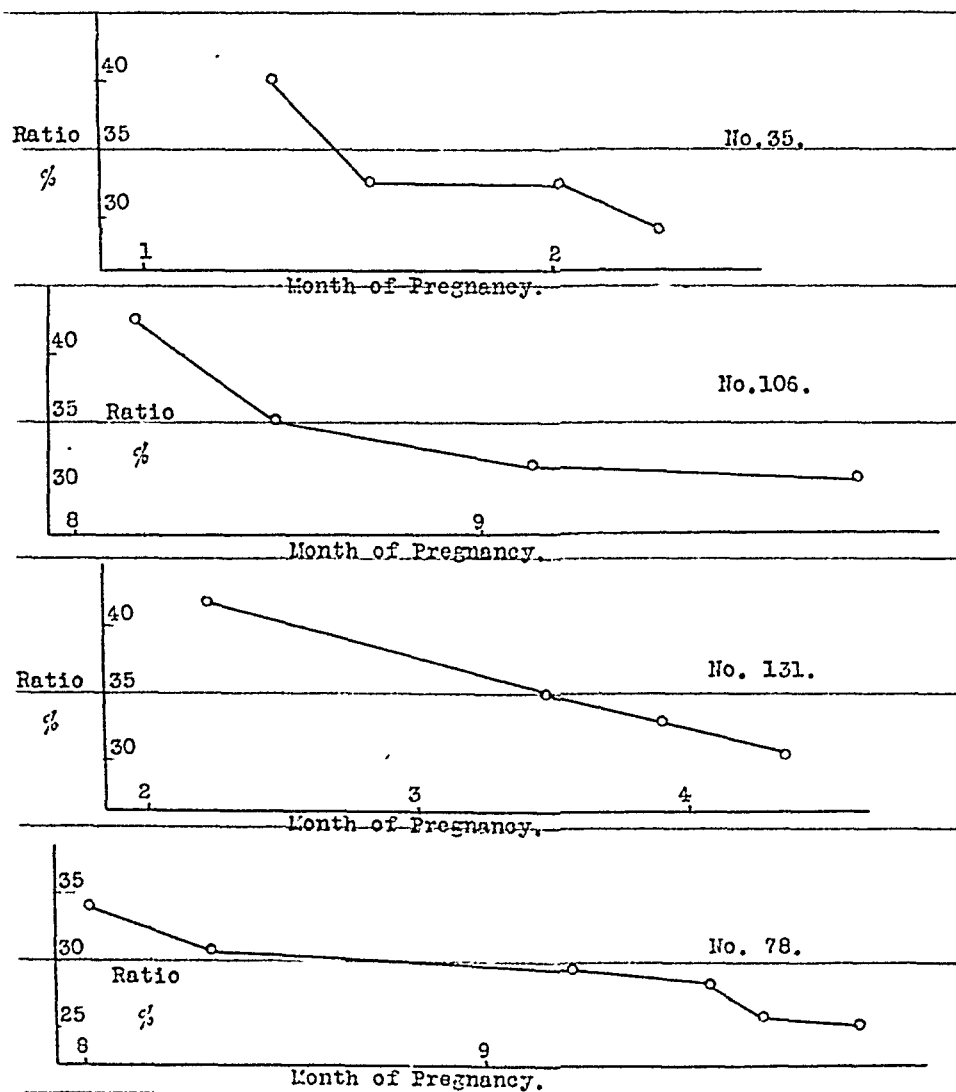


Fig. 1.

and average figures obtained on our antepartum series, while in Table II we give the same data for our postpartum observations.

In 24 cases we were able to obtain several samples of blood at intervals of a month or more during the antepartum period, and in several instances it was also possible to repeat these observations after delivery. Several curves prepared from the data obtained in these latter cases are presented in Figs. 1 and 2.

SUMMARY

Our results may be briefly summarized. In the normal pregnant woman there was observed in the majority of cases a slight decrease in the concentration of nonprotein nitrogen of the blood which is accompanied by a relatively large decrease in the urea nitrogen fraction.

VARIAION OF THE RATIO UREA NITROGEN: NONPROTEIN NITROGEN DURING PREGNANCY

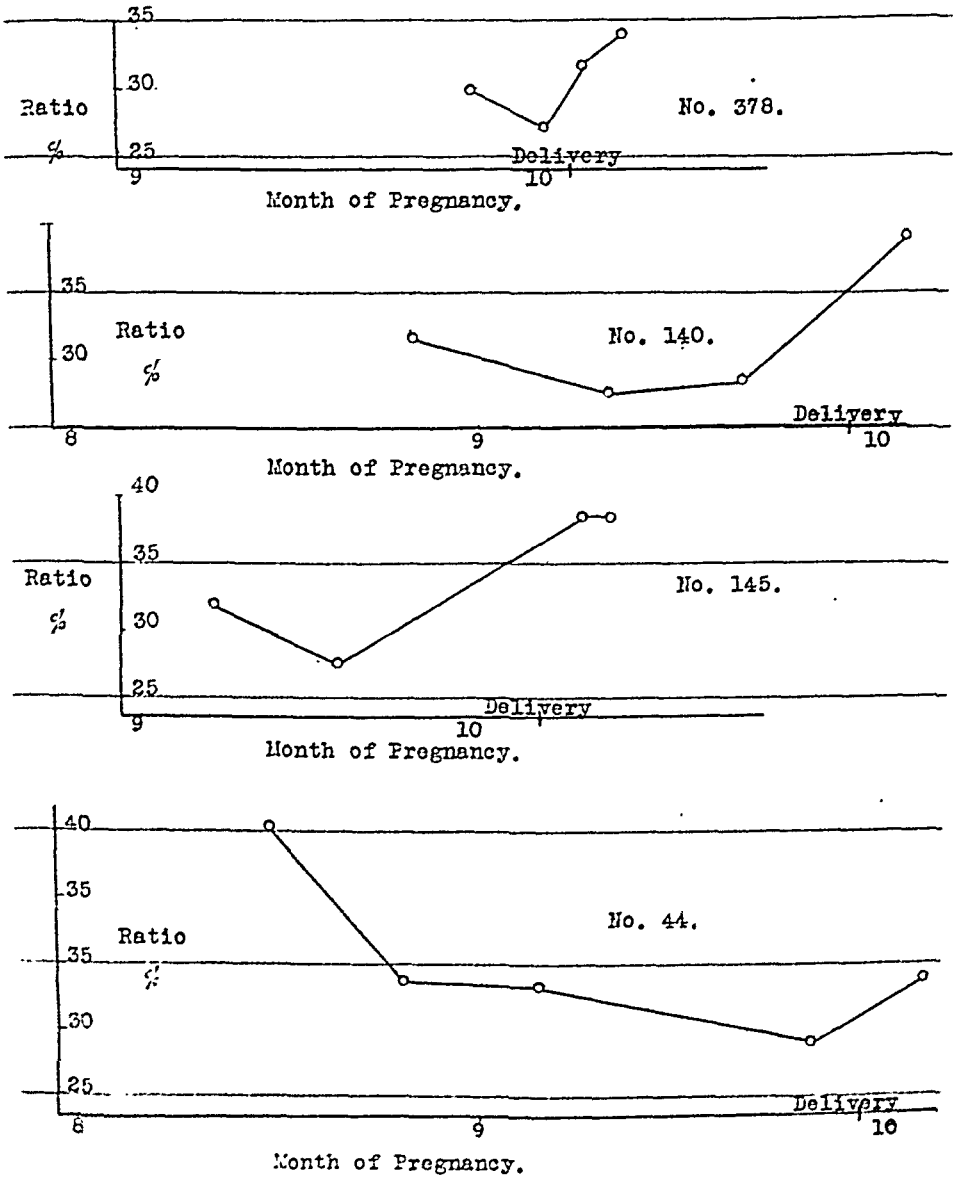


Fig. 2.

Values for urea nitrogen of over 10 mg. per 100 c.c. of blood were noted in less than 4 per cent of our cases, while results as low as 5 mg. of urea nitrogen per 100 c.c. of blood were obtained. Needless to say such abnormal values as the one just cited were checked by repeated analyses, so that we felt reasonably sure that they were not due to analytic errors.

The average figures presented in Table I show a slight but gradual decrease in the ratio of urea nitrogen to nonprotein nitrogen during the course of pregnancy, while the results on postpartum blood given in Table II indicate an equally definite and gradual rise in this ratio.

This fall in the urea nitrogen, nonprotein nitrogen ratio during the advance of pregnancy with the subsequent rise during the postpartum period is also shown graphically in Figs. 1 and 2.

The following figures in the different types of cases studied also offer further evidence for our conclusion that in pregnancy the ratio of urea nitrogen to total nonprotein nitrogen in the blood is lower than in non-pregnant individuals.

Average ratio of urea nitrogen to nonprotein nitrogen in the blood:

In 162 normal pregnant women	33.1
In 55 women eleven hours to five months after delivery	42.6
In 4 normal nonpregnant women	45.6
In 10 normal men	48.5

REFERENCES

1. Folin, O.: *Physiol. Rev.* 2: 469, 1922.
2. Folin, O.: Mellon Lecture, Univ. of Pittsburgh, 1917.
Stander, H. J.: *Bull. Johns Hopkins Hosp.* 35: 133, 1924.
3. Killian, J. A., and Sherwin, C. P.: *AM. J. OBST. & GYNEC.* 2: 6, 1921.
Caldwell, W. E., and Lyle, W. G.: *AM. J. OBST. & GYNEC.* 2: 17, 1921.
Harding, V. J., and Drew, K.: *J. Obst. & Gynec. Brit. Emp.* 30: No. 4, 1923.
Harding, V. J., Allen, K. D., and Van Wyck, H. B.: *J. Obst. & Gynec. Brit. Emp.* 31: No. 4, 1924.
4. Plass, E. D.: *J. Biol. Chem.* 56: 17, 1923.
Plass, E. D.: *Bull. Johns Hopkins Hosp.* 35: 345, 1924.
Bunker, C. W. O., and Mundell, J. J.: *J. A. M. A.* 83: 836, 1924.
5. Folin, O., and Wu, H.: *J. Biol. Chem.* 38: 81, 1919.
6. Van Slyke, D. D.: *J. Biol. Chem.* 73: 695, 1927.

A COMPARATIVE STUDY BASED ON FIVE HUNDRED CONSECUTIVE CASES OF INDUCTION OF LABOR*

BY RALPH A. REIS, M.D., CHICAGO, ILL.

A SUCCESSFUL method of inducing labor is a necessary part of the armamentarium of every obstetrician. To be completely successful such a method must not only initiate labor in a large percentage of cases but must also assure mother and fetus the greatest possible degree of safety. Many methods are described in the literature. Of these, some are successful but dangerous to mother or fetus, others carry no increased fetal or maternal morbidity or mortality but are successful in only a small percentage of cases.

The first recorded induction of labor was done in 1738 in England when Mary Donnelly ruptured the membranes in a patient with contracted pelvis in order to induce premature labor. The next recorded method was devised by Kluge who inserted sponge tents into the cervix. Simpson and Scanzoni each attempted the induction of labor by injecting carbonic acid gas into the uterus. Krause, in 1855, reported the method now known by his name, namely, the insertion of soft rubber bougies between uterine wall and fetal membranes. Kiwisch sought to induce labor by alternating hot and cold vaginal douches. All of these methods were unsatisfactory in that labor was induced in only a comparatively small percentage of cases.

The most successful of the above procedures is the Krause method. This has many adherents even today. Among these Bauld¹ reports that 60 to 70 per cent are successful, and Davis² recommends bougies as being "highly successful and never dangerous." Hewitt³ believes the method to be of value but warns especially against the rather large percentage of failure and the increased incidence of local infection and sepsis following its use. That the method also carries a definite risk from trauma as well as from infection is attested to by the reports of Robinson⁴ and others who report severe hemorrhages following perforation of the placenta by the bougies. This is prone to occur especially in those patients in whom the placental site is low.

In 1888 the de Ribes bag was devised as a means of initiating labor. This was later modified by Barnes and also Voorhees, and today these three types are still of value. Bag induction, while it has proved very efficient, must of necessity carry an increased morbidity and mortality. Passing the bag through the vagina into the cervix together with the fact that it remains in place for several hours, increases the possibility of uterine contamination by vaginal bacteria.

In an attempt to avoid such an increase in morbidity and mortality, Klein⁵ has recently developed a procteurynter, which in his hands was successful in 60 per cent of a series of 800 cases. Nettlesheim⁶ found this method successful in only 46 per cent of his patients. Baum⁷ has replaced the rubberized bag by a sheep bladder which is inserted through the cervix and is then filled with glycerin. This increases in size while in the uterus by the process of osmosis, and thus stimulates labor pains. Neither Baum nor Sztchelos⁸ who also recommend this procedure give their percentage of success or their morbidity figures. Druskin⁹ used pigs' bladders filled with glycerin in a series of 84 patients, some of whom also received castor oil and small doses of pituitrin, and reports that 97 per cent were successful.

*Read at a meeting of the Chicago Gynecological Society, May 18, 1928.

The induction of labor by medicinal means has received a great deal of attention because of the fact that there is no increase in maternal infection from vaginal or intrauterine manipulation. Castor oil is well-known for its stimulation of smooth muscle and of the lower sympathetic nerve centers. Its powers are enhanced when combined with an oxytoxic, such as quinine. The administration of castor oil is therefore frequently followed by quinine either in broken and frequent doses or in one to three larger doses. Muschallik¹⁰ reports 58.6 per cent success in his series of inductions by means of castor oil and quinine, Bailey¹¹ had 72.7 per cent success in 55 patients, and Johnston¹² had 63 successful inductions in 80 patients, an incidence of 79 per cent.

The use of quinine is not entirely free from danger. Williamson¹³ who used castor oil and quinine with success in only 46.6 per cent of his series of 300 patients, reports several cases of marked cinchonism. Gellhorn¹⁴ has reported two fetal deaths following the use of quinine. Torland²⁹ has recently described a similar case.

Since Oliver and Shafer¹⁵ isolated the physiologically active substance of the pituitary gland in 1894, and Blair Bell¹⁶ found that this substance produced and stimulated uterine contractions in rabbits, many investigators have attempted to induce labor with pituitary extracts. Fries¹⁷ and Studeney¹⁸ in 1911 were the first to report successful inductions of labor by hypodermic injections of this substance. Stein and Dover¹⁹ in 1917 reported 34 patients in whom labor was induced by castor oil followed by three minim doses of pituitary extract. They were successful in 60 per cent of these. A. Stein²⁰ succeeded in inducing 70 per cent of his patients by giving two ounces of castor oil followed by two minim doses of pituitary extract at hourly intervals. Watson^{21, 22} followed one ounce of castor oil and three ten-grain doses of quinine by injections of one half cubic centimeter of pituitary extract every thirty minutes. In 75 per cent of his patients, labor began at once. Browne²³ using the Watson technic in 44 patients was successful in 90 per cent but had four stillbirths from this method. One of these he attributes to the use of the pituitary extract. Watson in 195 inductions had a fetal mortality of 6.5 per cent. Scott²⁴ modified the Watson technic by decreasing the dosage of pituitary extract in order to avoid this excessive fetal mortality and in 198 patients was successful in about 90 per cent. He had no fetal deaths which he could attribute to the use of the pituitary extract. Mathieu²⁵ reduced the pituitary extract to three minims every thirty minutes following the castor oil and quinine, and in 72.5 per cent was successful in starting labor. Williams²⁶ found the Watson technic to be 80 per cent efficient and had no untoward results from either the quinine or the pituitary extract. Cron²⁷ used castor oil and quinine followed by five minim doses of pituitary extract in 45 patients and succeeded in 69 per cent.

While pituitary extract has many adherents, it has also been denounced frequently in the literature because of its supposed inefficiency and more especially because of the increased fetal mortality following its use. Bailey¹¹ condemns its use, and Polak²⁸ has recently stated that "the employment of pituitrin to induce labor is hazardous and in view of the fact that we have many excellent safe methods, pituitrin should be kept for the third stage of labor only."

This investigation which includes the results of 500 consecutive inductions of labor in 430 patients was undertaken as a means of comparing the various methods of induction of labor now in use. It was felt that more definite conclusions could be drawn from the results obtained when the different methods were used in one obstetric clinic than by attempting to compare the results of one method as used in one clinic with the results of another technic as used in a different clinic. This series covers the period Jan. 1, 1925, to April 1, 1928, in

the obstetric department of the Michael Reese Hospital and includes all of the inductions of labor during this period in patients who were calculated to be more than thirty-eight weeks pregnant.

Indications.—Of the 430 patients, 253 had normal pregnancies and labor was induced at term. One hundred twenty-two were calculated to be 41 to 44 weeks past the last menstrual period when the induction was done. In 33 patients labor was induced because of toxemia, 16 being between thirty-eight to forty weeks pregnant, in 7 because of contracted pelvis and in 4 because of the death of the fetus. There were also 4 patients with placenta previa, 2 with cardiac disease, 2 with severe pyelitis, 2 with transverse presentations, and 1 with an abruptio placentae.

Indications

At term -----	253	Placenta previa -----	4
Past term -----	122	Cardiac disease -----	2
Toxemia -----	33	Pyelitis -----	2
Disproportion -----	77	Transverse -----	2
Dead fetus -----	4	Abruptio placentae ----	1

Induction Rate.—In 388 patients the induction of labor was successful. In 26 patients a second induction was done, in 7 there were three attempts, in 6 there were four attempts and three patients were induced five times before labor set in. In this series no attempted induction was considered successful unless labor set in within twelve hours after the induction was begun.

Methods.—Six methods of induction were tried. In the first group, castor oil, two ounces, was used and in the second group the castor oil was followed by quinine, five grains every hour until labor began or until three doses had been given, the fetal heart tones being controlled before each successive dose. In the third group the castor oil was followed by one minim doses of pituitrin. The first dose was injected at the height of the castor oil irritation and was repeated every thirty minutes until labor set in or until a maximum of eight doses had been given, the fetal heart tones being controlled before each successive dose. In the fourth group one minim doses of pituitrin were given without the castor oil, the same technic of administration being employed. In the fifth group castor oil, quinine, and pituitrin were used. First the two ounces of castor oil were given followed by five grains of quinine in one and two hours. One-half hour after the second dose of quinine, one minim doses of pituitrin were started and were employed as in the other groups. In the sixth group induction was done by means of a Barnes' or Voorhees' bag.

In addition there was a large number of patients in each group in whom the membranes were stripped or separated from the lower uterine segment. Vaginal examination upon admission is, with certain exceptions, routine in the Michael Reese Hospital. This has previously

been shown to be harmless,²⁹ and without effect upon puerperal morbidity. During such a vaginal examination it is a simple matter, if desired, to insert the finger through the cervix and by a sweeping motion, around the inner circumference of the lower uterine segment, to separate the membranes. This maneuver must, of course, be gentle in order to avoid rupturing the membranes and is aided, when necessary, by pressing the head into the pelvis with the abdominal hand. The criterion of a successful stripping is a blood stain on the examining finger. The remaining patients in each group were examined vaginally but separation of the membranes was carefully avoided.

Castor Oil.—There were 119 patients induced by castor oil. Of these, the membranes were stripped in 70 and in the remaining 49 no cervical manipulation was done. In the latter group there were 29 primiparae and 16 (55 per cent) went into active labor. Ten of the 20 multiparae (50 per cent) also responded to the castor oil. Of the 70 patients in whom the membranes were stripped, there were 38 primiparae and 30 (79 per cent) went into labor; there were 32 multiparae and 24 (75 per cent) went into labor. The delivery was spontaneous in 53 (66.2 per cent), low forceps were used in 24 (30 per cent), midforceps in one (1.3 per cent) and cesarean section was done twice (2.5 per cent) for failure of engagement of the fetal head. The gross morbidity for the group was 11.3 per cent. In this report gross morbidity includes every patient with a puerperal complication and every patient whose temperature reached 100.4° F. one or more times. The corrected morbidity includes only those patients in whom a definite complication developed. For this group the corrected morbidity was 6.3 per cent due to five patients with foul lochia without fever. Among the 119 babies there was one baby with asphyxia livida who recovered spontaneously. There was no fetal mortality.

Castor Oil and Quinine.—Ninety-eight patients were given castor oil and quinine to induce labor. In 60 the membranes were stripped and of the 28 primiparae, 24 (86 per cent) went into labor; 25 (78 per cent) of the 32 multiparae responded. Eleven (69 per cent) of the 16 primiparae and 13 (59 per cent) of the 22 multiparae whose membranes were not stripped went into labor. The delivery was spontaneous in 56 (76.7 per cent), low forceps were used in 12 (16.4 per cent), in two breech extractions were done (2.7 per cent) and three (4.2 per cent) were delivered by cesarean section on account of relative disproportion. The gross morbidity was 16.4 per cent and the corrected morbidity was 4.2 per cent due to one patient with sapremia and two with foul lochia.

Castor Oil and Pituitrin.—Castor oil and pituitrin were used to induce labor in 142 patients. In 113 of these, the membranes were stripped and 34 (74 per cent) of the 46 primiparae and 60 (89.5 per cent) of the 67 multiparae responded. In 29 patients no stripping

was done and 4 (56 per cent) of the 7 primiparae and 16 (73 per cent) of the 22 multiparae went into labor. There were 85 (74.6 per cent) spontaneous labors, 20 (17.5 per cent) deliveries by low forceps, 7 (6.1 per cent) deliveries by midforceps, and one (0.9 per cent) delivery by high forceps. One patient was delivered by version and extraction for face presentation (0.9 per cent). The gross morbidity was 15 per cent and the corrected morbidity was 8.7 per cent due to three patients with mild sapremia, five with foul lochia, one with pyelitis, and one with a left thrombophlebitis. The fetal mortality was 1.8 per cent due to two fetal deaths, and the fetal morbidity was 1.8 per cent due to one baby with a fractured clavicle and one with cerebral hemorrhage with apparent recovery.

The average number of one minim doses of pituitrin was seven and in the successful group the average number of doses was 3.4. There was one case of mild uterine tetany lasting for twenty minutes. This followed the second one minim dose of pituitrin in a twenty-six-year-old primipara in whom induction was done in the thirty-ninth week of pregnancy on account of a preeclamptic toxemia. No treatment was required for the tetany. The remainder of the labor was uneventful, a live baby being delivered spontaneously six hours after the induction was started.

Pituitrin.—Forty-one patients were given pituitrin. In 19 the membranes were stripped and of the 8 primiparae, 4 (50 per cent) responded and of the 11 multiparae, 1 (9 per cent) responded. In 22 patients the membranes were not stripped. There were 6 primiparae and 3 (50 per cent) went into labor; there were 16 multiparae and in 5 (31 per cent) the induction was successful. There were 10 spontaneous deliveries (84.6 per cent), and 2 low forceps deliveries (15.4 per cent). There was a morbidity of 7.7 per cent due to one patient with a foul lochia. One baby had an asphyxia livida which was overcome by means of a tracheal catheter.

Castor Oil, Quinine and Pituitrin.—Induction of labor was attempted in 62 patients by means of castor oil, quinine, and pituitrin and in 51 of these the membranes were stripped when the oil was given. Fourteen of these 51 were primiparae and 13 (91 per cent) went into labor; 37 were multiparae and 35 (94.6 per cent) responded. In 2 (50 per cent) of the 4 primiparae and in 6 (86 per cent) of the 7 multiparae in whom no stripping was done, labor set in. The delivery was spontaneous in 38 (68 per cent); low forceps were used in 13 (23.2 per cent), midforceps in 3 (5.2 per cent), and high forceps in one (1.8 per cent). One patient was delivered by a cesarean section after a fourteen-hour test of labor in which there was failure of engagement of the fetal head.

Bag Induction.—Labor was induced in 38 patients by means of a bag. Of these ten were primiparae and 28 were multiparae. In 36

(94.7 per cent) the induction was successful. Delivery was spontaneous in 21 (58.3 per cent), by low forceps in 7 (19.4 per cent), by mid forceps in 2 (5.6 per cent), by high forceps in one (2.8 per cent), and by version and extraction in 5 (13.9 per cent). There was one maternal death from the effects of a severe postpartum hemorrhage followed by shock. The patient was a twenty-six-year-old primiparae who was very stout and had a masculine type of pelvis. After eight hours of labor the head was engaged but in spite of strong, frequent pains the cervix did not dilate. A Barnes' bag was inserted to hasten dilatation, and, after four hours, the delivery was effected by midforceps. A postpartum hemorrhage of approximately 500 c.c. resulted and the foot of the bed was elevated on account of the ensuing shock. During the next twelve hours there was a persistent trickling of blood from the uterus and the patient died in spite of blood transfusion, and treatment of the shock. The gross morbidity was 33.3 per cent and the corrected morbidity was 27.8 per cent due to two intrapartum infections, four patients with sapremia, five with foul lochia and one patient who developed a puerperal sepsis and thrombophlebitis, from which the recovery was protracted but complete.

RESULTS

A comparison of the various methods of induction employed shows that pituitrin alone is the least efficient, only 31 per cent of the 41 patients responding. Of the 119 patients in whom castor oil was given, 67 per cent responded. When quinine was added to the castor oil 75 per cent went into labor and when pituitrin was added to the castor oil 80 per cent responded. The best results, 90 per cent, were obtained by a combination of castor oil, quinine, and pituitrin.

The percentage of success in those patients in each group in whom the membranes were stripped is markedly increased over the results obtained in those in whom no stripping was done. Fifty-three per cent responded to the castor oil but when the membranes were stripped at the time that the castor oil was given, the percentage of success increased to 77 per cent. In the castor oil quinine group, stripping increased the satisfactory results from 63 per cent to 81 per cent. In the castor oil pituitrin group only 69 per cent responded but when stripping was added, there was a response in 83 per cent. When pituitrin was used alone 26 per cent went into labor and when the membranes were stripped, 36 per cent went into labor. Following the administration of castor oil, quinine, and pituitrin, 73 per cent responded but when, in addition, the membranes were stripped 94 per cent resulted in active labor. The introduction of a bag produced labor in 95 per cent of the patients.

The average time interval that elapsed between the beginning of the induction and the onset of labor was the same for the group in whom the membranes were stripped and those in whom no stripping was done. The average time for primiparae was three hours and thirty-five minutes and for multiparae was two hours and forty-five minutes. The average length of labor for primiparae was sixteen and one-half hours and for multiparae was seven and one-half hours. It would seem, from these figures, that, while stripping the membranes increases the percentage of patients who respond to induction methods, there is no effect upon either the speed of the response to induction nor upon the length of the resulting labor. The average length of labor for both primiparae and multiparae is approximately the average one for labors in general following spontaneous onset. Induction methods apparently have no effect upon the length of labor.

Parity.—There is a very definite feeling in the literature on induction that multiparae show a greater percentage of response to induction methods than do primiparae. From this investigation it would seem that such is not the case. Of the group in whom inductions were done without stripping 58 per cent of the primiparae and 57.5 per cent of the multiparae responded. Of the group in whom inductions were done with stripping, 78.4 per cent of the primiparae and 80 per cent of the multiparae responded. Apparently primiparae respond to induction methods to the same degree as do multiparae.

Delivery.—The incidence of operative delivery is not effected by the induction of the labor. In this series of inductions, 73.5 per cent delivered spontaneously, 18.8 per cent were delivered by low forceps, 3.1 per cent by midforceps, 1.0 per cent by high forceps, 2.2 per cent by version and extraction and 1.4 per cent by cesarean section. In the years 1926 and 1927, the corresponding figures for all patients delivered in the obstetric departments of the Michael Reese Hospitals are spontaneous delivery 70.1 per cent, low forceps 19.3 per cent, midforceps 6.7 per cent, high forceps 0.9 per cent, version and extraction 0.7 per cent, and cesarean section 2.3 per cent.

Morbidity.—During the year 1926 to 1927 the gross morbidity in the obstetric department was 8.6 per cent and the corrected morbidity was 5.1 per cent. In this series the gross morbidity, exclusive of bag inductions, was 11.3 per cent and the corrected morbidity was 6.3 per cent. In the group in whom no stripping was done, the gross morbidity was 10.5 per cent and the corrected morbidity was 5.8 per cent. In the group in whom the membranes were stripped, the gross morbidity was 11.6 per cent and the corrected morbidity was 6.4 per cent. It would seem from a comparison of these figures that the medicinal induction of labor increases the gross and corrected morbidity by 15 to 20 per cent. The increase, when stripping is added is between 25 and 30

per cent. Both of these increased morbidity rates are, however, considerably less than the rates following induction by bag insertion.

Fetal Mortality and Morbidity.—The gross fetal mortality for all full-term pregnancies and deliveries at Michael Reese Hospital is 3.1 per cent and the gross fetal morbidity is 4.9 per cent. In this induction series the fetal mortality was 0.7 per cent and the fetal morbidity was 2.8 per cent. Induction of labor is apparently not dangerous to the fetus.

Repeated Inductions.—There is a small but definite group which seems to resist induction by practically all methods. In this series, there were six patients in whom four inductions were done and three patients in whom five attempts were made. Of the latter, one was a twenty-one-year-old primipara at term, in whom the membranes were stripped when the castor oil was given. The second attempt was by castor oil and quinine two days later. The last three attempts were at forty-eight-hour intervals and were by castor oil and pituitrin. She delivered spontaneously twenty-four hours after the last attempted induction. The second patient, a thirty-two-year-old para ix, was at term and failed to respond to membrane stripping and castor oil, castor oil and pituitrin, castor oil and quinine twice, and finally castor oil. She was allowed to go home and returned in six days in spontaneous labor. She was delivered of a 4200 gm. baby which was healthy and quite apparently overdue. The third patient was a thirty-year-old para iv, estimated to be forty-two weeks pregnant. She was given castor oil on two successive days, castor oil, quinine, and pituitrin on the fourth day, castor oil and pituitrin on the sixth day, and on the eighth day a Voorhees' bag was inserted. She was delivered spontaneously after a six-hour labor and the recovery was uneventful. The baby was a healthy girl weighing 3874 gm.

SUMMARY

This is a report of 500 consecutive inductions of labor in 430 patients all of whom were past the thirty-eighth week of pregnancy. In 338 patients the induction was successful. In 26 patients there were two inductions and in 16 patients there were three to five inductions. Six methods were tested. Pituitrin alone was successful in 26 per cent, castor oil in 53 per cent, castor oil and quinine in 63 per cent, castor oil and pituitrin in 69 per cent, castor oil with quinine and pituitrin in 73 per cent, and bag insertions in 95 per cent. Stripping the membranes markedly increases the percentage of success in each group. After the membranes were stripped, pituitrin was successful in 36 per cent, castor oil in 77 per cent, castor oil and quinine in 81 per cent, castor oil and pituitrin in 83 per cent, and castor oil with quinine and pituitrin in 94 per cent. Primiparae respond to induction methods to the same degree as do multiparae. Stripping the membranes does not hasten

the onset of labor nor shorten the duration of labor. The medicinal induction of labor raises the gross and corrected morbidity from 8.6 per cent and 5.1 per cent to 10.5 per cent and 5.8 per cent respectively. When stripping is added, the morbidities increase to 11.6 per cent and 6.4 per cent respectively. The morbidity following bag inductions in this series is 33.3 per cent and 27.7 per cent respectively. There is no effect upon fetal mortality or morbidity.

CONCLUSIONS

1. The most efficient method of medicinal induction of labor, at or near term, is castor oil, quinine, and pituitrin.
2. The efficiency of all medicinal methods tested is materially enhanced by the stripping of the membranes.
3. Induction methods, at or near term, are as efficient in primiparae as in multiparae.
4. Induction of labor does not affect the character of the delivery.
5. Morbidity without stripping was slightly greater than the morbidity in the obstetric department as a whole; the addition of stripping resulted in a further increase in morbidity. However, these figures are still approximately only one-third of those following bag induction in this series.
6. Induction of labor is apparently not dangerous to the fetus.

REFERENCES

- (1) *Bauld, W. A. G.*: *Canad. M. A. J.* 16: 677, 1926. (2) *Davis, E. P.*: *AM. J. OBST. & GYNEC.* 2: 1, 1921. (3) *Hewitt, J.*: *J. Obst. & Gynec. Brit. Emp.* 34: 520, 1927. (4) *Robinson, J. H.*: *Lancet* 212: 653, 1927. (5) *Klein, H.*: *Zentralbl. f. Gynäk.* 50: 2493, 1926. (6) *Nettesheim, W.*: *München. med. Wehnschr.* 74: 894, 1927. (7) *Baum, C.*: *München. med. Wehnschr.* 73: 531, 1925. (8) *Szechlo, T.*: *München. med. Wehnschr.* 73: 281, 1925. (9) *Druskin, S. J.*: *J. A. M. A.* 82: 370, 1924. (10) *Muschallik, N.*: *Monatschr. f. Geburtsh. u. Gynäk.* 52: 378, 1920. (11) *Bailey, K. F.*: *Lancet* 1: 282, 1926. (12) *Johnston, R. A.*: *South. M. J.* 19: 215, 1926. (13) *Williamson, A. C.*: *Surg. Gynec. Obst.* 34: 812, 1922. (14) *Gellhorn, G.*: *AM. J. OBST. & GYNEC.* 13: 6, 1927. (15) *Oliver, G., and Shafer, E.*: *J. Physiol.* 16, 17, 18: 1894. (16) *Blair-Bell, W.*: *Brit. M. J.* 2: 1609, 1909. (17) *Fries, I.*: *München. med. Wehnschr.* 2438, 1911. (18) *Studeney, T.*: *Wien. klin. Wehnschr.* 1766, 1911. (19) *Stein, A., and Dover, M.*: *M. J. & Rec.* 2: No. 90, 238, 1917. (20) *Stein, A.*: *Zentralbl. f. Gynäk.* 49: 1152, 1920. (21) *Watson, B. P.*: *AM. J. OBST. & GYNEC.* 1: 1, 1920. (22) *Idem.* 4: 6, 1922. (23) *Browne, F. J.*: *Edinburgh M. J.* 34: 1, 1924. (24) *Scott, W. J.*: *AM. J. OBST. & GYNEC.* 12: 571, 1926. (25) *Mathieu, A.*: *AM. J. OBST. & GYNEC.* 13: 223, 1927. (26) *Williams, J. W.*: *J. A. M. A.* 83: 1768, 1924. (27) *Cron, R.*: *AM. J. OBST. & GYNEC.* 3: 253, 1922. (28) *Polak, J. O.*: *Idem.* 14: 845, 1927. (29) *Ris, R. A.*: *Idem.* 8: 475, 1924. (30) *Torland, T.*: *J. A. M. A.* 90: 1190, 1928.

104 SOUTH MICHIGAN AVENUE.

(For discussion, see page 419.)

HEMIPLEGIA DURING PREGNANCY, WITH THE REPORT OF A CASE*

By R. A. SCOTT, M.D., F.A.C.S., EVANSTON, ILLINOIS

(From the Obstetrical Service, Evanston Hospital)

ONLY a few cases of hemiplegia with onset during pregnancy have been reported and practically all of these seem to have resulted from cerebral thromboses. Lafon's admirable review of the literature in 1896 revealed 25 cases; in 1925 Talley and Ashton were able to add only 17 more. A recent search of the literature failed to find any additional cases. The case here reported is the only one that occurred during the pregnancies of the last 5,000 women delivered at the Evanston Hospital.

The hemiplegias due to cerebral thrombosis nearly all occur in the first three weeks of pregnancy. The cause has been traced to some focus of infection in about 75 per cent of instances. In all cases reported there were no deaths and about 50 per cent made a partial or complete recovery.

The case reported here occurred in Mrs. N., 25 years old, para ii, who presented herself for prenatal care March 15, 1926, in the second month of her pregnancy. The general examination was negative. There were no complaints. The blood pressure was 112/82 and the urine was negative. From March 15 to September 6 the patient was seen at the office every second week. The systolic blood pressure varied between 98 mm. and 112 mm. of mercury. There seemed to be nothing unusual about the patient's progress until during an office call late in July she mumbled something unintelligible and began to cry. She explained with difficulty that it was hard for her to form the words that expressed her thoughts. As the patient was of a rather excitable temperament, the condition was attributed to an attack of hysteria and triple bromides were prescribed. That evening she reported herself much improved. From this time until September 13 attacks similar to the one just mentioned occurred on several occasions, usually when the patient was very tired or had had some undue excitement. Each attack subsided following administration of bromides. On the evening of September 13, 1926, after spending an unusually quiet and pleasant day at her mother's home and feeling exceptionally well, the patient was preparing to retire when she was seized with a feeling of tiredness and a sensation of numbness on the right side of the face and in the right arm and leg. Immediately afterward she discovered that she could not move her right arm or leg. Upon endeavoring to call her husband from an adjoining room, she found that she was unable to talk plainly. The author saw the patient within an hour following the attack. A rather superficial examination revealed a paralysis of the right side of the face and of the right arm and leg. The patient was very much upset, alternately crying and laughing. Still being of the opinion that the symptoms were probably due to hysteria an effort was made to quiet the

*Read at a meeting of the Chicago Gynecological Society, May 18, 1926.

patient with sedatives but with no avail. The following morning Dr. L. J. Pollock was called in consultation. He wrote concerning his findings and opinions in a letter as follows:

"When I examined Mrs. N. on September 15, 1926, I found a right-sided hemiplegia, with rather marked rigidity and involuntary movements of the right arm. The deep reflexes of the right side were markedly increased, and an ankle and knee clonus was elicited. There were Babinski, Oppenheim and Chaddock reflexes on the right side, and the abdominal reflexes were diminished on both sides. The visual fields grossly were normal and ophthalmoscopic examination failed to reveal any pathology. Although prior to my examination there had been very slight diminution of sensation on the right, when I examined her there was considerable loss of deep sensibility particularly in the right arm. A rather severe grade of transcortical aphasia was present. Considering the history of recurrent attacks of what might be interpreted as focal or cortical fits or of slight attacks such as one would get from a vascular spasm, it was necessary to exclude a possible cerebral neoplasm. The subsequent course with absence of any evidence of increased intracranial tension, headache, vomiting, or choked disc, slow pulse, etc., suffices to exclude a neoplasm. The negative serologic picture was sufficient to exclude the possibility of syphilis of the nervous system. One is, therefore, compelled to conclude that we are dealing with some type of vascular pathology, which may be either a thrombosis or an embolism. I was unable to determine any possible predisposing illness which would produce a thrombus. Emboli, although frequent after childbirth, occur during pregnancy as well. The numerous attacks speak more for thrombus than for embolus. They both result in a pneumonic infarct, giving about the same prognosis. I would expect a gradual improvement in motion and a diminution in spasticity and involuntary movements in the arm as well as complete recovery of the leg and speech."

The patient was sent to the Evanston Hospital. X-ray examinations of the head revealed no evidence of brain tumor or increased intracranial pressure. Spinal puncture revealed a negative spinal fluid, Wassermann tests on spinal fluid and blood were negative. Blood counts and urine were negative, and temperature was normal.

The treatment consisted entirely of complete rest in bed. Speech improved and there was a slight return of movement in the arm and leg. On October 14 labor was induced by routine methods, and a normal eight hour multiparous labor and spontaneous delivery with a normal living child resulted. After two weeks, passive motion and gentle massage were instituted. The patient left the hospital on December 8, 1926, eleven weeks after her hemiplegic attack and seven weeks after delivery. She was able to walk and to use her arm and leg fairly well. Improvement was most evident in her speech, which was practically normal. Physiotherapy treatment was continued for one month when the patient left the city. Following an examination March 2, 1928, Dr. Pollock wrote,

"I re-examined Mrs. N. on March 2. She shows very remarkable improvement. At the present time she shows a right hemiparesis which is observed in her gait and which is characterized by slight rigidity of the right leg and in slowness and some clumsiness of movements of this leg and in slight incoordination and weakness of the right upper extremity. A considerable degree of intentional hypertonia is seen in the upper extremity, wherein after flexing the fingers the intended extension is interfered with by a persisting flexor contracture. The deep reflexes of the right side are increased as compared to the left. A right ankle clonus and knee clonus are found. The superficial abdominal reflexes are diminished on the right side, and a Babinski is present. There was no objective loss of sensation and no astereognosis.

The paraplegia had practically disappeared but occasionally some hesitation in the selection of words was noted. Ophthalmic examination of the visual fields showed normal findings."

SUMMARY

A report of a case of hemiplegia during pregnancy and a reference to the literature revealing 42 previously reported cases is made. It is reassuring to the obstetrician to know that this condition in no way complicated labor in any instance and that a large percentage of the patients recovered completely from the hemiplegia.

BIBLIOGRAPHY

Ahlfeld, F.: Arch. f. Gynäk. 11: 584, 1877. *Barbour, A. H. F.*: Edinburgh M. J. 1092, 1895. *Bennett, A. H.*: Brit. M. J. 261, Feb., 1881. *Bernard, H.*: Bull. Soc. d'obst. de Paris 296, 1898. *Churchill, Fleetwood*: Irish. J. M. 257, May, 1854. *Cook, F.*: Proc. Roy. Soc. Med. Lond. 16: Clin. Section, 1922. *Craik, Robert*: Lancet 2: 888, Sept. 1899. *Dreyfuss, G. L.*: Med. Klin. 539, Mar., 1914. *Duhot, E., and Paquet, A.*: Gaz. d. hôp. 93: 89, 1920. *Hosslin, R. von*: Arch. f. Psychiat. 38: 730, 1904; 40: 445, 1905. *Lafon*: 1896. *LeClercq, G.*: Thèse de Lille, 1919. *Marks, L. H.*: Dominion Med. Month., Toronto 20: 256, 1903. *Matthews, A. A.*: Northwest Med. 15: 370, Nov., 1916. *Moser*: Arch. f. Psychiat. 66: 720, 1920. *Oliver, J.*: M. Press 66: 53, 1898. *Rosenfeld*: Ztschr. f. Med. Wehnschr., 1702, 1908. *Talley, J. E.*: M. Clinics North America 8: 899, Nov., 1924. *Thomas, W. R.*: Brit. M. J. 886, Dec., 1877.

636 CHURCH STREET.

(For discussion, see page 419.)

CESAREAN SECTION

A REVIEW OF 109 CASES*

BY CLIFFORD B. LULL, M.D., PHILADELPHIA, PA.

(From the Philadelphia Lying-In Hospital)

THERE have been delivered at the Lying-In Hospital from October 1, 1924, to October 1, 1927, 2161 women. Among these, delivery by abdominal hysterotomy has been thought necessary one hundred and nine times. A review of these case histories forms the basis of this paper.

Statistics, as a rule, are uninteresting to most of us but it is the only way that we can accurately check our work, and allow us to compare our results with that of other clinics. It is a well-known fact that statistics can be made to fit the occasion, and although it hurts at times, it does us all good to know that none of us are perfect.

I will not attempt in this paper to compare these figures with other statistics in the literature but I am placing them before you to judge for yourselves.

It might be well to state that there are two services at the Lying-In Hospital which run concurrently through the entire year. These two

*Read at a meeting of the Obstetrical Society of Philadelphia, November 3, 1927.

services alternate cases on admission so that at the end of the year a like number of cases have been treated by each service. As there is no courtesy staff, all of these patients have been operated upon by one of the members of the staff and are about equally divided between the two services. As a general rule, at least two members of the staff have seen all the cases requiring cesarean section, before operation.

One hundred and nine (109) cesarean sections in 2161 deliveries give an incidence of 5.4 per cent.

The youngest patient operated upon was fourteen years of age, the oldest forty-three years, with an average of twenty-two years.

The colored race is more prone to have pelvic deformities than the white. There were 52 white women and 57 colored. As there were more colored than white in the total number of deliveries, the incidence of section was higher among the white women.

Seventy-seven of these patients were primiparae. One was a para viii who had a ruptured uterus on admission, one para v who had acute polyhydramnios with twin pregnancy at four and a half months, complicated by cardiorenal disease. One was a para iv who had had three previous sections. The remaining 29 patients were para ii who had had previous sections, mostly for contracted pelvis.

The indications for operation were as follows:

(a) Absolute contraction of the pelvis, 14 of whom had had previous sections	30
(b) Borderline contractions, all of whom were given a test of labor	43
(c) Contracted pelves of various degrees and previous cesarean sections	11
(d) Fibroids of the uterus interfering with descent of the head	2
(e) Premature separation of normally implanted placenta	2
(f) Central placenta previa	5
(g) Failure of dilatation of the cervix	4
(h) Epilepsy and sterilization	1
(i) Varicosities of the vulva and vagina	1
(j) Ruptured uterus	1
(k) Preeclamptic toxemia	3
(l) Acute polyhydramnios, cardiorenal	1
(m) Cardiac disease	2
(n) Hernia of the uterus	1
(o) Separation of the symphysis and tuberculosis of the hip	1
(p) Dystocia due to previous operation on the uterus	1

It is our general rule to operate upon patients who have an internal conjugate of less than 8 cm. at the time of election and classify them as absolute contractions. The borderline case is allowed to go into labor and if, after a test of labor, averaging about eight hours, there is no attempt at engagement, section is done. This is the type of case which offers more opportunity for poor judgment than any other type of obstetric patient. All of our patients who had had previous cesarean sections were again sectioned.

Fibroids are considered an indication when they obstruct the birth canal. Premature separation of a normally situated placenta with no dilatation of the cervix and marked internal hemorrhage was the indication in two cases. All of our patients with central placenta previa were sectioned.

That the cervix of some primiparae around forty years of age does not dilate, was borne out in four cases. These patients all had a definite test of labor, at the end of which time they evidenced no progress in effacement or dilatation. Living babies were obtained in each case and all made uneventful recoveries.

The one case of epilepsy was mentally deficient, her morals were unspeakable and she was sectioned and sterilized at the request of her family. The one case of varicosity was in such condition that it was impossible to even make a vaginal examination.

In these two thousand cases, we had one ruptured uterus, an emergency case who had been in labor twenty-two hours before admission in a moribund condition.

The only indication for abdominal section in eclampsia we believe to be in an elderly primipara who, after several hours of eliminative treatment, shows no ability to dilate her cervix or improve in general condition. In preeclamptic toxemia, occurring in the latter months of pregnancy, especially in a primipara where treatment over a period of several days shows no improvement, the uterus can be emptied with safety by the abdominal route. The risk can be definitely diminished by use of local anesthesia.

There are certain types of cardiac disease complicating pregnancy upon whom the strain of labor might end in cardiac dilatation. Although the risk is great either way, section, especially under local anesthesia, certainly saves some of these women. How much a heart can stand is rather a difficult question to settle, as was brought out by one of these cardiac cases. The consultant cardiologist estimated in this patient that she would die no matter how she had her baby. This patient made an uneventful recovery after section with local anesthesia. Her physician reports her in good condition one year later.

The hernia of the uterus was accompanied by left torsion and transverse position. The one case of dystocia, caused by previous operation on the uterus, had had two previous abdominal operations, was forty-three years of age, and her youngest child was nineteen years old.

Ether was given 104 times, straight nitrous-oxide twice and local anesthesia three times. The question of what anesthesia to use is, I believe, an important one. Ether, if given properly, is unquestionably the safest. Although in this series only three cases were done under local anesthesia, I believe there is a definite field for its use in doing this operation on certain types of individuals.

The classical type of operation was done in all of this series, myomectomy once, celiohysterectomy three times and fifteen patients were sterilized upon whom previous sections had been done.

Our attitude has been to advise sterilization at the time of the second section if both children are alive and the patient desires it. One of these patients upon whom we did the fourth section was supposed to have been sterilized at the time of her third cesarean. At operation, it was found that the previous operator, in another city, had resected the fallopian tube on one side but had inadvertently used the round ligament instead of the tube on the opposite side.

Fifty-one of these patients were operated upon before, at the onset, or very shortly after the onset of labor. One patient was in labor sixty-one hours, one forty-eight hours, and one forty-one hours. The average for the other patients was approximately twelve and one-half hours. The patient in labor sixty-one hours had unruptured membranes and had had only one vaginal examination. Where there is definite indication for operation before the onset of labor, no vaginal examinations are made. If the patient is to be given a test of labor, usually one careful vaginal examination is made at the end of the test labor.

One patient in this series had four vaginal examinations before operation. Her membranes were unruptured, however, and she made an uneventful recovery.

One hundred and three patients had unruptured membranes at the time of operation. Six had ruptured but had not been manipulated before admission to the hospital.

Excluding the mortality, which I shall discuss later, the morbidity had been figured on the same basis as we estimate our normal cases, namely, an elevation of temperature to 100° twice in any twenty-four hours, not including the first twenty-four hours after delivery. The temperature is taken every four hours. Ten patients had no morbidity. The morbidity in the other cases was what we considered normal post-operative reactions, except in the following, which had the associated complications. There occurred:

Thrombophlebitis	4 cases	Engorged breasts	3 cases
Infected wound	3 cases	Influenza	1 case
Pyelitis	2 cases	Tonsillitis	1 case
Bronchopneumonia	3 cases	Sapremia	2 cases
Bronchitis	2 cases	Heat stroke	1 case
Breast abscess	2 cases	Cystitis	1 case

There occurred in this series 7 deaths, a mortality of 6.4 per cent. They were as follows:

CASE 9.—A primipara, twenty-four years of age. The indication for operation was contracted pelvis. She had been in labor on the outside for twenty-two hours. The child was dead in the peritoneal cavity. Hysterectomy was done and the patient died a short time after operation from shock.

CASE 48.—A primipara, eighteen years of age, with contracted pelvis. She died twenty-four hours after operation, from collapse of the left lung. The child is living and in good condition.

CASE 55.—A primipara, seventeen years old, with contracted pelvis. Ether anesthesia, unruptured membranes. Had been in labor fourteen hours. There was a question as to the number of vaginal examinations that had been performed. She died on the fifth day of paralytic ileus. The child is living and in good condition.

CASE 56.—A primipara, twenty-one years of age with contracted pelvis. Had been eight hours in labor and had had one vaginal examination. Had unruptured membranes. Died on the fifth day from large tubo-ovarian abscess. The child is living and in good condition.

CASE 88.—Para ii. First child was stillborn by version; had a contracted pelvis. She was operated on before the onset of labor, had no examinations, membranes were unruptured. Died on the fourth day from peritonitis.

CASE 92.—A primipara, aged thirty-six years, eight months pregnant. Had cardiorenal disease. Operated under local anesthesia and died on the fifth day from complete suppression of urine. She did not respond to medical treatment and it was thought best to terminate the pregnancy.

CASE 106.—A primipara, aged eighteen years, admitted for toxemia also cardiac condition. She was not in labor. Developed a complete premature separation of the placenta while in the hospital ward. Although but a short time elapsed before operation, the baby was stillborn and the mother died of hemorrhage.

One hundred and one patients were discharged in good condition, and although a few were not followed up, the ones who were, have remained in good physical condition.

Nine babies were stillborn or died shortly after birth. Both children of the cases of premature separation were stillborn. One child whose mother had central placenta previa died of prematurity. One child died of an undeveloped pulmonary system and one died of subperiosteal hemorrhage. Also, one died of enlarged thymus and one was definitely luetic. The patient operated upon for epilepsy had a twin pregnancy, both of which died shortly after delivery. All other children left the hospital in good condition. The ruptured uterus case was stillborn.

From a study of these case histories, I would conclude:

1. That we were fortunate in not having more patients referred after ineffectual attempts were made to deliver on the outside.
2. That the case operated upon before, or at the onset of labor had a much less stormy convalescence than a patient operated upon after having been in labor for several hours.
3. That borderline or elective section offers more chance for unwise decision than any of the problems presented to the obstetrician. That the decision to operate in these cases should be made early before the membranes have ruptured and the patient has had numerous examinations.

4. That even the ideal case for section, namely, the patient who has had a definite indication before the onset of labor, who is a good operative risk, whose membranes are unruptured and who has had no vaginal examination, sometimes adds a mortality to our statistics.

1731 PINE STREET.

(For discussion, see page 417.)

PROPHYLACTIC TREATMENT OF PUERPERAL INFECTION BY INTRAUTERINE APPLICATIONS OF ANTISEPTIC SOLUTIONS

BY SAMUEL S. ROSENFELD, M.D., F.A.C.S., NEW YORK, N. Y.

THERE are at present in vogue several methods of performing cesarean section which are more or less efficient in the prevention of general peritonitis. No method, however, can lay claim to the ability of preventing sepsis or puerperal endometritis.

Bacteriologic and pharmacologic studies reveal the causes for the almost universal failure of local treatment once bacteria have gained entrance into the cells. Treatment, to be effective, must be begun before the germs have gotten a foothold. It is much more logical to attempt to prevent sepsis rather than to try to cure it.

The World War has greatly enriched our knowledge of antiseptics, and the best methods of applying them. In the prophylactic treatment of uterine infection one should seek an antiseptic of high germicidal power, simple to prepare, preferably nonirritating to tissues and easy of application. With these criteria in mind neutral acriflavine was chosen. Its antiseptic coefficient is high, and it is nonirritating even in the peritoneal cavity. I injected guinea pigs intraperitoneally with acriflavine solution (1-1000) without any signs or symptoms of peritonitis resulting. Browning and Cohen claim that flavines are of particular value in the prophylaxis of infection, that is, to prevent the occurrence of inflammation and suppuration when applied shortly after the organisms have gained access to the tissues. The activity of flavines is not reduced by protein solutions such as serum.

Browning, Gulbraisen, and Thornton state that flavine compounds may be applied to the peritoneum with safety. In their conclusions they strongly emphasize the value of the flavine compounds, especially for the purpose of preventing the onset of septic manifestations in early wounds. Flavine retains its antiseptic powers when in contact with tissues and infected material for a much longer time than does Dakin's solution, and therefore need not be applied as often as the latter.

A great obstacle encountered by those using intrauterine antiseptics has been the difficulty of keeping the tubes carrying the solutions in

place for any length of time. Uterine contractions force the tubes out within a few hours or a few days. Several more or less ingenious and complicated appliances have been devised to keep the tubes in place. The author, because of its efficacy and its ease of procurement, has found an ordinary rubber T-tube best suited for this purpose. The rubber must be of first quality as it is absolutely essential that the tubes remain patent. The tubes may be obtained ready for use from the dealer, or may be easily fashioned by perforating the upper end of a rubber tube, inserting a cross-piece of rubber tubing and attaching the latter securely by sewing it with silk or linen thread to the vertical tube. Since blood clots and débris can easily block the tubes, these should be perforated in several places so as to insure egress for the antiseptic solution. In the vertical end of the tube the perforations should be made high, just below and above the T cross-piece so as to permit the fluid to exit at or near the fundus. Gravity will then insure that the lower portions of the uterus come in contact with the solution. To insure a return flow and guard against the antiseptic entering the peritoneal cavity through the fallopian tubes, at least two rubber treatment tubes should be introduced into the uterus. In guinea pig experiments I have not been able to produce peritonitis after the injection of human lochia containing saprophytic organisms. Mixtures of lochia and acriflavine also failed to produce peritonitis. I at first tried to use continuous irrigations of warm acriflavine solution (1-1000) but found it impracticable. I now have two tubes irrigated with 30 c.c. each of (1-1000) neutral acriflavine solution every eight hours night and day. In presumably infected cases where cesarean section is indicated and performed, the tubes are introduced through the uterine incision and the lower ends brought out through the vagina, strapped to one thigh and enclosed in a sterile towel. In cases when delivery is effected *per vias naturales*, the tubes are introduced through the cervix with a dressing forceps and affixed to the thigh as described above.

This treatment is indicated in all cases where infection is presumably present. The first three cases in which I employed this method will exemplify the cases suitable for this treatment.

CASE 1.—Mrs. J. W., age twenty-eight, para i. Admitted to Lebanon Hospital Feb. 18, 1928, discharged March 5, 1928. Membranes had ruptured three days before she was admitted into the hospital, "strong pains" commenced twenty-four hours before admission. She was examined many times at home, the attending physician not using gloves. Examination at the hospital revealed that the patient had a generally contracted pelvis, and that the head was unengaged. The author thereupon performed a cesarean section with drainage under local anesthesia, as described by him in the August, 1926 number of the AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY. Two T-tubes were inserted through the uterine incision, brought out through the vagina and attached to the thigh. Acriflavine solution (1-1000) was introduced through the tubes every four hours. Three days after operation, a culture from the vagina revealed the presence of the follow-

ing organisms: *B. coli*, pneumococci, *Staphylococcus pyogenes aureus* and gram positive, saprophytic bacilli. On the second day after operation the temperature was 103.4°, on the fifth day the patient had a chill and the temperature rose to 105.2°. A leucocyte count on the same day showed W.B.C. 13,600, polys 94 per cent. The temperature came down on the same day and remained normal until discharge from the hospital. The tubes were removed the sixth day after operation.

CASE 2.—Mrs. A. W., aged twenty-five. Admitted to Lebanon Hospital April 15, 1928, discharged May 2, 1928. Membranes ruptured a few hours before onset of labor. The patient had a flat pelvis, and it was deemed advisable to give her a test of labor. After forty-six hours of labor there was no engagement of the fetal head. I thereupon performed a cesarean section employing the same technic as in Case 1. Temperature at time of operation was 101°. The temperature range during her convalescence was between 98.6° and 101.6°. The tubes were removed eight days after operation.

CASE 3.—Mrs. Y. S., aged thirty-eight. Admitted to Lebanon Hospital April 8, 1928, discharged April 19, 1928. On day of admission the patient felt a fetal part protruding from her vagina. This proved to be a hand. The cervix was rigid and tightly enclosed both the arm and forearm. She delivered spontaneously twenty-eight hours after admission to the hospital. Two T-tubes were inserted through the cervix immediately following delivery, and removed April 14, 1928. Patient had no rise of temperature during her entire stay in the hospital.

I do not claim that these patients would not have recovered had they been treated with other antiseptics or even without any antiseptics at all. Dakin's solution, mercurochrome or one of the dyes might be as good or even better. Neutral acriflavine was chosen because on theoretic grounds it seemed to me to be the most suitable antiseptic for this particular work. It is hoped that others employing this procedure will report their results, so that it will be possible to properly evaluate both the efficacy of the antiseptics used and the method in general.

SUMMARY

1. Most good can be obtained from the use of antiseptics if they are applied before the pathogenic organisms have penetrated into the cellular structures.
2. Acriflavine is a suitable antiseptic for intrauterine application.
3. Rubber T-tubes are practicable for intrauterine flushing.
4. Three patients who were presumably infected were treated successfully with intrauterine injections of acriflavine.

In conclusion I wish to express my gratitude to D. A. J. Rongy for his helpful suggestions and kind cooperation.

REFERENCES

- Bougenot, P.*: Paris Theses, 1920-21. *Browning, Gulbraisen, and Thornton*: Brit. M. J., July 21, 1917. *Browning, and Cohen*: Brit. M. J., Oct. 21, 1921. *Eggerth, A.*: J. Infect. Dis., May, 1926. *Gentz, G.*: Paris Theses, 1920-21. *Mann, L.*: M. Rec., Jan. 22, 1921. *Meloney, and Zau*: J. A. M. A., Jan. 23, 1925. *Sherman, W.*: Surg. Gynec. Obst., July, 1928. *Weil, H.*: New York M. J., June 19, 1909.

SOME FACTORS IN POSTPARTUM MATERNAL MORBIDITY*

BY OWEN J. TOLAND, M.D., CYNWYD, PA.

THE following study has been made from the records of the Lying-In Hospital of Philadelphia.

The cases are not selected in any way except to exclude the cesarean section cases, as it seems that the procedure is in itself sufficient to produce a morbidity without any extraneous factor.

The criterion of morbidity in these cases is an elevation of temperature to 100° or over twice in any twenty-four hours, not necessarily consecutively, excluding twenty-four hours following delivery; temperatures being taken routinely fourth hour day and night in all patients.

This series consists of 500 cases and includes every type of delivery except cesarean section. In this series there were 128 patients morbid from all causes, a total of 25.6 per cent. In these 128 patients the most frequent factor present was the condition roughly described as blocked lochia. Of these there were 39. In each of these cases there is a note stating that scant lochia corresponding to the elevation in temperature caused the morbidity. This group represents 30.4 per cent of the total morbidity.

The next most frequent cause can be attributed to engorged breasts. There were 34 of these cases which represents 26.5 per cent of the total morbidity.

The third most frequent cause in this series is intercurrent infection, morbidity occurring in 21 cases, or 16.3 per cent. These intercurrent infections include: pyelitis, 1 case; pharyngitis, 2 cases; tonsillitis, 2 cases; bronchopneumonia, 5 cases; Vincent's angina, 1 case; acute arthritis, 2 cases; grippe, 1 case; salpingitis, 4 cases; nephritis, 1 case; fistula in ano, 1.

Fourth in the list came constipation and "no cause discovered," each with 11 victims to their credit. Combined these make up 17.1 per cent.

These five causes aggregate 90.3 per cent of the morbidities. The remaining 9.7 per cent include fissured nipples, 2 cases; cause set down to artificial termination of labor, 2; infected perineal repairs, 7; and hemorrhage, 1.

These statistics are taking a group of 500 cases as a unit.

To see if luetic taint had any influence on the percentage of morbidity, the cases were divided into two groups: luetic and nonluetic in the percentages noted. It is interesting to record that in this series of 500

*Read at a meeting of the Philadelphia Obstetrical Society, November 3, 1927.

cases, coming as they did from the worst elements of the city, there were only 52 with luetic taint. These occurred as follows: 34 cases in which both maternal and cord Wassermanns were positive; 11 cases in which maternal was positive and cord negative; 3 cases in which maternal was positive and cord anticomplementary; 1 case maternal anticomplementary and baby's positive; 3 cases in which maternal was negative and baby's positive.

In the group with a luetic taint, 52 in all, there were 16 morbidities, which gives 30.7 per cent morbid as opposed to 25.2 per cent morbid in the nonluetic group. This figure though somewhat higher is not striking.

When the series was grouped into cases of spontaneous delivery as opposed to those with artificial termination of labor, the result was slightly more clear cut. The total series was 46 cases with artificial termination. Of these 16 were morbid, which gives the figure a 34.8 per cent morbidity as opposed to 25 in the nonoperative group. It is noteworthy that of the 16 morbid cases only 2 were set down as having the morbidity due to the operative procedure.

An attempt was made to establish some relationship between the length of the second stage of labor and the percentage of morbidity, but the figures on the charts were so varied that no logical deduction could be arrived at.

The conclusions to be drawn from this study seem to be:

1. The incidence of maternal morbidity, excluding cesarean section, is about 25.6 per cent, when our standard of morbidity is employed.
2. That luetic taint and operative deliveries have but little influence on the percentage of morbidity.
3. That both maternal and cord Wassermanns should be taken routinely, or many cases with luetic taint will go undiagnosed.

315 CLWYD ROAD.

(For discussion, see page 416.)

Society Transactions

THE NEW YORK OBSTETRICAL SOCIETY

MEETING OF OCTOBER 9, 1928

DR. T. C. PEIGHTAL presented a case report entitled **Torsion of the Fibromatous Uterus**. (For original article see page 363.)

DISCUSSION

DR. HOWARD C. TAYLOR said that in the case of a large tumor such as this, the diagnosis between a twisted uterus with a fibroid tumor and an ovarian cyst with a twisted pedicle is practically impossible, but it makes no difference so far as the treatment itself is concerned because either condition requires an operation without delay. In a smaller tumor where you can feel definitely a fibroid tumor in the uterus, it is possible to make a diagnosis, but even here most of the diagnoses are made at the time of operation.

DR. E. W. HOLLADAY referred to one point in the differential diagnosis which Dr. Peightal did not bring out and which came up in a case operated on by the late Dr. Studdiford in Bellevue Hospital, which was evidently of the intermediate chronic type and had no acute exacerbation so as to give a clear-cut diagnosis. Degeneration of a fibroid was considered and the condition was found to be a bipolar fibroid accompanying a very early pregnancy in a woman at the menopause. Pregnancy was not suspected and was not noted until after the hysterectomy.

DR. G. L. MOENCH said that these cases are very rare, that Schultze found only 52 reported cases, and saw only 4 of these in 1,000 laparotomies. Dr. Moench has seen 2 cases, one in which the uterus itself and its long, narrow cervix was twisted more than completely around its axis. The other was a case in which a pedunculated fibromyoma was twisted on its axis. Both of these cases are reported in the literature early in 1916.

DR. SYDNEY S. SCHOCHET read a paper (by invitation) entitled **Experimental Endometriosis**. (For original article see page 328.)

DISCUSSION

DR. JAMES EWING spoke of the extreme caution with which the speaker of the evening succeeded in surrounding his work, and, therefore, he felt that almost anything he might say might be open to error. However, it is perfectly obvious that Dr. Schochet has been proceeding upon a very carefully planned system of experiments. If his work had no other value, it would reveal the extreme care which one must observe in undertaking any experiments upon growth in which factors are added, the effects of which he proposes to determine. So many intercurrent factors may come up that the extreme caution which Dr. Schochet has shown is certainly most essential. It is also obvious that any work of this sort must involve a considerable knowledge, not only of normal growth and general physiologic and pathologic conditions but also of chemistry and physical chemistry. Dr. Schochet seemed to him to be one of the first to attempt in a systematic way the control of these physicochemical factors.

While there is in the literature of cancer research today a considerable list of contributions claiming to demonstrate the effects of changes in osmotic tension on the permeability of the cell membrane, on the alkalescence of cell fluids, Dr. Ewing was not convinced that experimenters were sufficiently critical or accurate to warrant any trust in their conclusions. Two authors especially, Watterman and Rodman appeared in London recently at the Cancer Congress with contributions in this field. Their contributions seemed extremely ambitious in the field of speculation and very fragmentary and unsatisfactory in regard to the facts presented. In other words, they had not succeeded in controlling their experiments sufficiently to warrant any conclusions whatever. Dr. Ewing felt that to date there are in the literature no definite proofs that these changes in osmotic tension, or permeability of cell membrane, have actually any effect on the proliferation of tissue cells. If that is the case, then Dr. Schochet has been the first to succeed and is to be congratulated.

Now, the question is: Has Dr. Schochet succeeded in showing that the two sensitizing agents, strontium chloride and iron compounds have been the cause of these rather definite changes in the implanted endometrium? Dr. Ewing's examination of the experimental sections impressed him as having a distinctly different character from the controls, and the sections shown are rather more striking in that respect. Dr. Ewing felt he would like to see a control specimen carried along with each one of these experiments to determine not only whether the cell changes are uniform but also if their tenacity of life is prolonged. If he can show that the sensitized specimens not only show this peculiar proliferation but also that the proliferation goes further and the cells live longer, say, three or four times as long, then the evidence he has would be much more convincing.

Dr. Ewing believed that Dr. Schochet was justified in assuming that the result is due to factors which he introduced. Its bearing upon the question of endometriosis may not be direct. Strontium chloride is not thought of as accompanying the floating fragments of endometrium during menstruation, nor is any other drug, but there may be other chemical agents which do accompany these floating particles.

Dr. Schochet said that hemolytic agents tend to increase the permeability of the cell membrane and to increase oxidation. Hemolytic agents are present in the hemorrhagic fluid of the menstrual flow, and it is not impossible that he will be able to trace in the endometrial fluids chemical agents which may have the same efficacy as strontium chloride and iron.

On the whole Dr. Ewing believed that this study strengthens the belief that loose fragments of endometrium may become implanted, as Sampson and Jacobson have shown, and grow to a larger extent than has been supposed. In other words he substantiates Sampson's theory.

DR. VICTOR C. JACOBSON said that this ingenious method of studying endometrium, by growing it in the anterior chamber of the eye, so that it can be seen from day to day, opens up a considerable field for experimental work and that Dr. Schochet in continuing his study will determine the effect of the various hormones we have at present and combinations of them.

In so far as transplantation of endometrium to the eye is concerned, since it is so far removed from its original source, there is no possibility of local reaction from substances emitted by the uterus through the tube. This method of endometrial culture in the eye offers interesting possibilities in the study of the reactions of this very remarkable tissue. There is, perhaps, no counterpart in human pathology except the ectopic endometrium which we can see at the so-called bleeding umbilicus or in a laparotomy wound. In such locations, after the endometrium has reached a certain size, it is recognized by the patient as being very painful at the time of the menstrual period and is often visible as a bluish or reddish-blue mass which

each month becomes enlarged. Of course, there is considerable tissue overlying such a tumor, skin, subcutaneous and fascial connective tissue, so that in all probability it is not possible to see the more delicate changes take place such as can be followed so well in the experiments by Dr. Schochet in the anterior chamber of the eye.

Dr. Schochet also stated that he has found that the endometrium seemed to have an increased virulence or viability during estrus. At any rate it is apparently more easily transplanted during estrus than when taken during the resting period.

Dr. Jacobson hoped that it would be possible to work out a technic so refined that Dr. Schochet can transplant only epithelium and not stroma cells, or transplant stroma cells and not epithelium. That, he believed, would show the effects of various inorganic and organic substances upon the two main types of cells found in the endometrium. There is much of interest in this for the obstetrician particularly in regard to the question of ectopic decidua. Dr. Jacobson believed that in every full-term pregnancy, careful examination of the tissues of the pelvis will reveal ectopic foci of decidua without any endometrial glands beneath the serosa of the ovary, the posterior wall of the uterus and in the perisinous tissue of some of the pelvic lymph nodes. It is surprising the wide distribution it has. It is a question whether these decidual cells arise from transplanted endometrial stroma or from fibroblasts which were there all the time but which came in contact with that substance which permits fibroblasts to develop into decidual cells. Dr. Jacobson favored the idea that they are not as a rule due to transplanted stroma cells, unless glands are also present.

DR. ROBERT T. FRANK said that Dr. Schochet in a few words summarized an extensive and controversial literature. Sampson's work has focused new attention upon the origin of endometrium- or adenomyoma-like tissue in the pelvis. Cullen has shown continuous invasion by endometrial glands. Sampson believes in discontinuous metastatic implantation. Others ascribe the seminoplastic deposits to inflammatory metaplasia.

Dr. Schochet found that only uterine musculature implanted in the guinea pig's eye showed rhythmic pulsation, but unfortunately no effort was made to see the difference in implants in the castrated and noncastrated male and female animal. Therefore the full importance of this most interesting observation (rhythmic contraction) cannot be drawn.

The rate of growth of uterine transplants as demonstrated by Frank (published in the *Journal of Cancer Research* in 1916) is so dependent upon the presence or absence of the female sex hormone, that no conclusions upon the fundamental and tremendously important question which Dr. Schochet raises should be drawn unless this source of error is entirely eliminated. Dr. Frank stressed this particularly because Dr. Schochet had taken such extreme precautions in other directions in order to avoid error both in interpretation and experimentation, and he desired to save him the possibility of being misled by these factors.

Dr. I. C. RUBIN asked if the mitosis was in some respects atypical or always typical. He felt that these cells under abnormal conditions merge or escape from their limiting membrane and present a picture in the syncytial masses that is almost analogous to that seen in so-called incipient carcinoma, where there is a hypochromatosis and atypical mitosis with irregularity of position and relationship of one cell to another and also in size.

DR. SCHOCHET said in closing that it was impossible to answer all of the questions as we do not possess exact and definite knowledge of the mechanism of cell growth, namely, the factors that cause cells to increase in number under normal physiologic conditions. Dr. Ewing has emphasized many basic problems on growth pertinent to this work. At the present time it is not possible to

determine whether we are increasing the longevity of life of these endometrial cells. We are not aware of the length of life of most of the cells of the body with the exception of the nerve cells (which do not reproduce) and the non-nucleated red blood cells which are believed to live between twenty-one and twenty-four days in the blood stream.

In reference to the transplants there is an increase in the size, structure, and arrangement of the endometrial glands. Many mitotic figures are present, and on this strong presumptive evidence one may conclude that there is an actual increase in number (hyperplasia) of cells. It is not possible, however, to ascertain whether the cells present are from the original transplant plus hyperplasia, or only the progeny of the absorbed endometrial cell transplant. In one animal, Case 4, this transplant was active after a period of nine months, and it is extremely doubtful if active normal endometrial cells live for this long period of time, since in situ, they are replaced during each diestral cycle.

Dr. Jacobson's question of virulence of tissue cells requires further elucidation. We are aware of a few phases of viability of cells, but it is desirable to be extremely cautious in adding new theories in our present state of knowledge of the individual cell. In the infections due to plants (bacteria) and to animal parasites (protozoa) there is a difference in the reactions to these groups in the animal body, but whether this analogous condition exists in the tumor cell or in the normal cell remains an academic question. It is conceded that every cell retains its inherent potential power to reproduce within certain limits, with the exception of nerve cells, when stimulated to growth by irritation or weak toxins.

Detail analysis of the work of Dr. Frank on lipid extracts were omitted in the outline of Dr. Schochet's experiments as this work is based on an entirely different principle. The suggestion of Dr. Frank of the action of hormones on the vascular reactions of the transplants may prove to be a very interesting experiment. In Dr. Schochet's experiments a modification of Loeb's idea of artificial parthenogenesis of the eggs of sea urchin, etc., was attempted with endometrial cells after a primary sensitization. Too little study has been given to the detail and minute structure of the cell. Further studies of the mitochondria, Golgi apparatus, internal changes of the cell during the cyclic period is required.

THE OBSTETRICAL SOCIETY OF PHILADELPHIA

MEETING OF NOVEMBER 3, 1927

DR. EDWARD D. ATLEE (by invitation) read a paper entitled **Preliminary Report on Treatment of Congenital Lues**. (Published elsewhere.)

DR. OWEN J. TOLAND (by invitation) read a paper entitled **Some Factors in Postpartum Maternal Morbidity**. (For original paper see page 411.)

DISCUSSION

DR. EDWARD A. SCHUMANN considered that the standard of morbidity as laid down by Dr. Toland was an extremely exacting one. A temperature reaching 100° twice in any twenty-four hours is a standard which would tax the skill of any obstetrician to maintain. In all the causes mentioned morbidities would apparently occur most often in puerperal endometritis with absorption of bacterial toxins which we call septicemia, and which is the commonest cause for elevation of temperature.

As to lochial block, Dr. Schumann felt that lochial block means nothing but a cessation of lochia. The hospital from which the statistics are gathered is to be praised for the very low morbidity shown.

DR. EDMUND B. PIPER wanted to call attention to the fact that in the terminology employed in this hospital the term lochial block is used to cover sapremia. The temperatures were taken every four hours over a period of four days and the morbidity included follicular tonsillitis.

DR. JOHN C. HIRST, II, said that as regards lochial block, it would be interesting to know how many cases were primiparous individuals and how many multiparous.

DR. MONTGOMERY said that in the Department of Obstetrics of the Jefferson Medical College, the standard of morbidity is a temperature which reaches 100.4° twice in one day or on two successive days, not including the first twenty-four hours after delivery. The morbidity at this hospital has been running about 25 per cent. This ratio would probably be a little higher under the standard Dr. Toland has given. However, he included the temperature reaction after cesarean section and of a number of cases of vaccinia, the reaction of the vaccination happening to occur during the puerperal period. Probably in the final analysis, the figures would be about the same.

DR. CLIFFORD B. LULL read a paper entitled **Cesarean Section—A Review of 109 Cases.** (For original article see page 403.)

DISCUSSION

DR. STEPHEN E. TRACY said that in a study of 1001 labor cases at the Jewish Maternity Hospital, 47 had pronounced advanced cardiac lesions. The treatment consisted of absolute rest in bed for several weeks before delivery and such medication as was necessary. The patients were allowed to go into natural labor. Morphia and scopolamine or morphia and magnesium sulphate were given during the period of dilatation. At the end of the first stage of labor under light anesthesia, 12 had normal deliveries, 34 were delivered with forceps and 1 was delivered by podalic version. In these 47 cases there was one maternal death which occurred in a patient with pronounced mitral stenosis with double pneumonia. This patient went into labor prematurely.

DR. CHARLES MAZER wanted to make a plea for the low cervical cesarean section which gives a much lower mortality. It is especially indicated in the potentially infected cases. Dr. Mazer had done only half the number of cesareans reported by Dr. Lull, but all with the exception of two were low cervical cesareans. Every patient had a good test of labor; some had forceps applied at home by their family physician. One primipara, thirty-six years old, was in labor thirty-six hours and was very toxic. A low cervical cesarean under spinal anesthesia resulted in a complete recovery after a prolonged convalescence. A low cervical cesarean is a little more difficult for the beginner and takes a little longer to do, but it is the safest operation giving the lowest mortality in the hands of the average surgeon. Dr. DeLee reported 350 cases with a mortality of only three. Dr. Mazer's series yielded no mortality. It seems to him that a woman who has had a cesarean deserves a test of labor in her subsequent pregnancies. Many of them deliver themselves spontaneously or with the aid of low forceps.

DR. DANIEL LONGAKER believed in the need for a clear definition of the test of labor and no woman has really had the test of labor unless that test is actual labor. If the patient has been in labor eight, ten or twelve hours, or even longer,

and it is the first stage, that is not a test of labor. He thinks the case to which the preceding speaker referred well illustrates the point. That woman had been in labor a number of hours, but when it came to actual labor, it did not take her very long to put it across. He differed with the last speaker and would urge not to bank too much upon immunity from morbidity or mortality in the low operation in a potentially infected case; under these circumstances there will surely be a rude awakening and disappointment will follow. Moreover, it is not always a safe operation. Dr. Harriman, his associate, has had his lesson: the low operation in a woman who had actually had a number of hours of the test of labor, the head firmly impacted at the brim in which craniotomy would better have been done because the woman was actually infected and died. In this case it required strong forceps traction to disengage the fetal head upwards and the child was stillborn.

Finally there is this question of local anesthesia, and here he felt there was one method of anesthetizing these patients extremely valuable especially in the toxemia cases and that is spinal anesthesia. It is very practical and safe so far as any method of anesthesia can be safe. Regarding the cardiac cases and the choice of ether, Dr. Longaker did not agree that ether is the safest of the inhalation anesthetics in obstetric cases. Following the lead of the late Sir James MacKenzie he would make a plea for chloroform in these cases. Here is one to whose counsel we should listen with very great respect for he was not only cardiologist but also general practitioner and obstetrician. MacKenzie's dictum as to the safety of this anesthetic in these cases should never be forgotten. "I always gave my obstetric patients in labor chloroform—my cardiac cases—and it never hurt them," says MacKenzie, and his words are worth remembering. Dr. Longaker said that his own rather large experience amply confirmed their truth.

DR. EDWARD A. SCHUMANN felt that one thing should be brought to the attention of the profession more earnestly, namely the basis upon which mortality rates are computed. Some believe that cesarean section in elective cases offers safe and nontraumatic way of delivery even in women who might be delivered by the vaginal route. When we are faced by mortality from clinics, the operation assumes a formidable aspect which is purely relative and not true of the case. Dr. Schumann believed we should go back to the old division of cases of cesarean by election and of necessity. Obviously rupture of uterus, separation of placenta—these cases ought not be grouped with the elective cesarean where the abdominal route has been chosen as the least traumatic method of delivery.

DR. LULL (in closing) said he had no intention to start an argument in regard to low cervical section. One hundred and three of those cases were operated upon with membranes intact. The low cervical section is technically a more difficult operation, and although it has a definite place in obstetrical surgery, Dr. Lull saw no reason for doing it in any of this series. In answer to Dr. Tracy, the two cardiac cases included in this group had very definitely impaired hearts. If he included all the women who had cardiac diseases he should probably include 25 or 30. All of the cases who had had previous section were done for contracted pelvis. In answer to Dr. Longaker, Dr. Lull assured him that when he said "test labor," he meant several hours of good vigorous uterine contractions.

The question of local or spinal anesthesia is very important. Personally he preferred to use local anesthesia, and although he had only done 15 cesareans with novocaine, he liked it very much. In only two cases was it necessary to give gas at the time of the extraction of the child. He agreed with Dr. Schumann, that it would be unfair to compare the statistics of this series with a series where they had a different class of cases. However, this report included all the cases done at the Lying-In Hospital during the past thirty-six months.

THE CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF MAY 18, 1928

DR. A. E. KANTOR demonstrated a tumor resembling a dermoid cyst which was removed from a fifty-one-year-old patient whose menopause occurred three years before.

The main complaint was pain in the pelvis on standing. Examination showed a hard tumor mass lying in the pelvis on the right side attached to the vaginal wall. She was brought to the hospital, and through a vaginal incision the tumor was removed. It proved to be a calcareous ovary; the contents of which were a gelatinous mass, somewhat resembling a dermoid cyst. It did not contain any of the thick material usually found. There was no other ovary. She made an uneventful recovery. On a recent examination she stated she was free from pain. The histologist could not definitely determine the type of cyst, but it was very likely a calcified corpus luteum cyst.

DR. R. A. SCOTT presented a paper entitled **Hemiplegia During Pregnancy, With the Report of a Case.** (For original article see page 401.)

DR. RALPH A. REIS (by invitation) presented a paper entitled **A Comparative Study Based on Five Hundred Consecutive Cases of Induction of Labor.** (For original article see page 392.)

DISCUSSION

DR. W. C. DANFORTH said that with reference to the use of quinine he thought that some of the poor results and the loss of fetal life were due to the fact that the doses in some instances are far larger than in the series reported. In his work he does not use over ten grains, two doses of five grains each at an interval of one hour. Many times much larger doses have been used, and they may have had something to do with the mortality that has been reported.

In choosing cases for induction by the Watson method of castor oil and quinine, one should determine by rectal examination in the office whether the patient is ready to go into labor. If the os will admit the finger, Dr. Danforth thought the chances were better than if one is dealing with a closed cervix, and furthermore the trauma required to enter such a cervix is far less. The essayist brought out the point that any method of induction has morbidity connected with it because the cervix is not clean, or free from bacteria, and the morbidity increases with the amount of interference. Stretching gives a little more morbidity than the use of drugs alone. The morbidity which comes from induction with the bag is greater than from mere stretching, because the trauma is greater since a foreign body remains in for hours. Dr. Danforth has had the same experience as the essayist and his colleagues. His mortality in forty-eight bag inductions was about 12.5 per cent. The patients are febrile for a time. The essayist's morbidity after stretching was 6 per cent in one series and 8 per cent in another, which proves that there is a certain definite morbidity to be looked for when these things are done. In the series reported it can be assumed that there was a definite indication in each instance.

Dr. Danforth, referring to the statement that primiparae responded as well as multiparae, said his impression was that the multipara responded a little better. In his work he has come to use the method by castor oil and quinine, pituitrin, and

stretching practically to the exclusion of the induction with the bag, for the reason that the morbidity in the latter is definitely greater, as his experience and that of the essayist have shown. Where the method is used carefully and no undue trauma is used in stretching and the patient is kept under careful observation after giving the pituitrin, there is not much danger. In his work he used 3 minims at a time at intervals of thirty minutes, the second and third doses not being given if the pains come on. He considered the method a very safe one that can be used in hospital work with a high degree of confidence.

DR. N. S. HEANEY said he was particularly pleased that the only methods of induction of labor which the essayist used were castor oil and quinine or the bag only if mechanical means became necessary. He believed that no other methods for the induction of labor need be considered at the present time. Rectal tubes, bougies and bags should be frowned upon.

Dr. Heaney had never seen a case where he thought that the quinine had any bad effect on the fetus. He never used more than nine grains of quinine at one time, giving three grains every hour for three doses, and if pains started the whole dose need not be given. Careful inquiry is made to see whether the patient has any idiosyncrasy for quinine before the first dose is given, because this is a very common peculiarity.

DR. RUDOLPH W. HOLMES said that for many years he had been convinced that bag induction was a mistake, as was the catheter, for induction of labor in minor pelvic deformities; for, if there should be an error of judgment in any individual case and after labor had supervened it was found that there still was cephalopelvic disproportion, cesarean section would have to be ruled out. As two bodies cannot occupy the same space at the same time, there is always a displacement of the presenting part with bag induction with a resultant high incidence of compound presentations or abnormal positions produced by the method. Anyone who minimizes this fact is stating an untruth. For years Dr. Holmes reserved the bag for previas, or other indications where urgency is a real element. He has frequently used the blind catheter for induction and always with success, even though there was a greater frequency of failure the first time than with the bag, and most certainly it was slower in action.

Dr. Holmes employed quinine, castor oil and pituitrin for years. He had used nasal applications of pituitrin on the personal suggestion of Dr. Hofbauer. He did not believe the results with nasal application could quite compare with the repeated small hypodermic injections of pituitrin. He cannot reconcile the statement that quinine has a pernicious effect on the baby for in the South physicians do not hesitate to exhibit large doses, seventy-five grains and more, with no ill-effects to mother or baby, in the presence of malaria. His custom was to give five grains hourly, for five or six doses, stopping with tinnitus, along with the oil and pituitrin.

The day before this meeting Dr. Holmes had tried a new method, new at least in this country, the induction of labor by the use of thymophisin. Twenty minutes after the first nasal application the patient had strong active labor, but after the second dose, an hour after the first, pains ceased, so that the next day the procedure had to be repeated. Apparently thymophisin does have a more definite action than pituitary extract, whether it really is better than the latter has yet to be proved.

He believed it was a serious mistake to use bag or catheter induction, or even to stretch the os, for each method carries with it risks which certainly will compromise the patient in the event that a section were required.

He asked Dr. Reis what happened to the other six per cent of the bag inductions, for he gives data on only 94 per cent.

DR. C. B. REED said he first called attention to the induction of labor at term in a paper before the American Gynecological Society in which he reported a series of three hundred bag inductions. He thought Dr. Reis would be interested in comparing the opposition which this paper encountered with the generous reception accorded his own work.

Dr. Reed was gratified to perceive and report that in the fifteen years which had elapsed since the publication of his paper the induction of labor at term had become a definitely established operation. The literature no longer teemed with queries and uncertainties regarding the employment of the maneuver but rather like the present essay what form or method would best succeed.

Dr. Reed reported that he had continued his investigations at intervals and used various methods. He reported 421 cases of pure castor oil and quinine induction, 383 cases of bag induction, 218 of pituitrin by injection and eight by nasal application. He also thought several patients had gone into labor through oral administration of pituitrin though he could not be sure.

His observations agreed with those of the essayist in the equality of responsiveness between multiparas and primiparas. He thought also that while castor oil and quinine would succeed in about 60 per cent of the cases yet the bag remained as the most reliable of the mechanical measures.

Dr. Reed's opinion regarding the stripping of the cervix which he expressed in the discussion on his paper in 1913 was unchanged. He still believed that the finger could not be introduced without carrying contamination from the vaginal walls into the cervix. The bag on the contrary being passed by sight and without contacts will enter clean. This point is supported and proved by the essayist in his morbidity report.

The question of pituitrin induction was most important. Many obstetricians have declaimed against the use of the drug and yet Dr. Reed, with an experience of 9,000 or ten thousand labors wherein pituitrin has been exhibited under his supervision, has not found a single instance where the disability of mother or child could be logically attributed to the drug. He regarded this agent as a powerful adjuvant to the obstetrician; though it was, like strychnine, morphine, antitoxin or even the knife, capable of misuse. Danger and damage can result from any drug which is ignorantly employed, and it is always well for those who do not understand the dosage or technic of administration to avoid the use of pituitrin altogether. The inexperienced should not decry a method or agent which they are afraid to use. The good surgeon does not denounce the knife.

Dr. Reed agreed with all the essayist's conclusions except the stripping of the membranes. He wished particularly to note and emphasize the finding that the introduction of the bag did not disturb the presentation. Dr. Reed made this point in his first paper but the charge has been thoughtlessly repeated again and again. The disturbance of the presenting part is almost entirely a matter of technic. The bag is intended for introduction into the cervix where it is harmless; but if an attempt is made through ignorance or design to carry it to the fundus, the presenting part may suffer dislocation.

Dr. Reed was disposed to criticize the use of the terms mature and post-mature. How did the essayist estimate his time? Was he so fortunate in the selection of his patients that they could give him all the necessary data? Many women frequent the obstetric clinics who have four or five babies without a menstrual flow. How did Dr. Reis manage such conditions? Did he measure the uterus or child? Dr. Reed thought it was very unwise for obstetricians to deprive themselves of the advantages which follow the routine measurement of the intrauterine

child. From these maneuvers the maturity of the child can be readily assured and other fetal conditions clearly and comprehensively determined. The McDonald, Ahlfeld and Stone-Perret methods were not difficult to acquire.

DR. MARK GOLDSTINE said that the most favorable time for the induction of labor is at term. The most favorable patient is a normal obstetric case. In his opinion the difficult time to induce labor is from the twenty-fourth to the thirty-second week. That presents an entirely different problem, particularly if one is faced with some severe pathologic condition such as severe toxemia or abruptio placentae. In placenta previa, quinine and castor oil are the wrong treatment because the more severe the pains, the greater the hemorrhage, until some means of checking the bleeding have been instituted.

As to inducing labor at term in normal pregnancies that is a matter of personal opinion. He has had difficulty in inducing labor around the seventh month when a difficult problem was at hand. He has never found any one method that was seventy-five per cent or eighty per cent good. He has had cases where castor oil and pituitrin did not work, where bag induction did not work, and where the bag pulled out of the cervix and left it undilated.

DR. CAREY CULBERTSON said that as a general proposition castor oil and quinine in his experience has been so satisfactory that he uses it first and only when it fails does he resort to one of the other methods. The rubber bag induction seemed to him to need a little further analysis. In some clinics the induction is started with a small bag, such as the old Carl Braun bag, then larger ones are inserted as the cervix dilates. He believed that this was an added factor in the sustained morbidity. For that reason he never uses a small bag but always a large one, such as the Voorhees' or de Ribes'.

The fetal morbidity following these labor inductions, as was pointed out, is of first importance. He had seen only one case, and that last year, where he believed the death of the child in utero might be attributed to the quinine; though he was neither persuaded nor convinced that that was the cause.

He asked Dr. Reis where attempted induction fails, how long does he wait before making another attempt? It has been his practice not to repeat the attempt at induction for several days, usually three, where it has not been effective the first time, provided the condition is such as to make it possible to wait. He referred, however, to patients who are at term and where labor is being induced on that indication.

He thought the point brought out by Dr. Goldstine with reference to the induction of labor in pathologic conditions prior to term was very well taken. Those are the cases that are the most difficult to put into labor; and where induction fails by one of these methods, it becomes necessary to attack the problem along entirely different lines.

DR. IRVING F. STEIN said he would like to correct one impression that Dr. Reis gave, namely, that all maternity cases at Michael Reese Hospital are examined vaginally. That applies to service cases for teaching purposes. In his own work when a patient comes in in labor she is not examined vaginally.

The question of stretching brings up a point that Dr. Danforth emphasized. He felt that if the lower segment is formed almost any method would succeed in inducing labor. If stretching alone was done, labor would set in. He has frequently seen patients who come in for examination with the cervix effaced and simple stretching would send the patient promptly into labor, particularly in multiparae. There are cases where the membranes rupture without examination. Rectal examinations show that membranes rupture, the cervix effaces and the patient goes into labor. In a comparison of those cases that are stretched without the use of quinine

and castor oil with those in which the drug was given, he stated that years ago quinine was used quite routinely, but it was observed that the heart tones became irregular, and the meconium discharge was more frequent than where quinine was not used. Not more than one minim of pituitrin is used because some patients have violent reactions from a three minim dose.

When the cervix is not effaced, the induction of labor by the ordinary bag produces crampy pains which do not dilate the cervix. This really constitutes a failure of induction. Sometimes eighteen to twenty-four hours later the patient goes into labor without an additional method being employed. Dr. Stein placed a twelve hour limit on the bag. He had such an experience in a multipara where simply crampy pains resulted. A leakage occurred in tying the tube and after six hours the bag came away. The pains continued as crampy pains. Not until twenty-four hours later did any change in the cervix present itself. The patient required a sedative in the meantime. She then went into labor and delivered spontaneously.

DR. H. W. SHUTTER of Milwaukee asked if Dr. Reis had any other means of inducing labor in the toxemias that could compare in efficacy to the bag.

DR. C. D. HAUCH said it had been his privilege since the beginning of Dr. Reed's induction work at Wesley Memorial Hospital not only to observe but also to deliver patients himself. The valuation that is placed on any type of work or any method will depend upon the results which that method produces. The mortality and morbidity rates will decide its merits. At Wesley Memorial Hospital the infant mortality rate in 1927 was fourteen per thousand. He was sure that the work of Dr. Reed and others practicing induction at Wesley did not tend to raise that percentage. In hospitals where these methods are not known or used the mortality rate in infants has been as high as seventy-nine per thousand, according to the statistics of the health department.

DR. J. P. GREENHILL said in discussing the effect of quinine on the fetus and the mother that it might be of interest to know that some specimens of quinine contain histamin. Hofbauer experimenting in animals produced abruptio placentae and a condition similar to eclampsia by injecting histamin. Perhaps some of the severe cramp pains and some of the fetal deaths therefore may be attributed to the histamin present in some specimens of quinine.

DR. REIS in closing said in answer to Dr. Danforth's question about the state of the cervix, that there was a slight difference when the cervix was effaced. Twenty-seven per cent of the successful inductions were in patients in whom the cervix was partially or completely effaced. In the unsuccessful group there were eighteen per cent who showed partial or complete effacement, so that effacement does favor a successful induction.

He had a separate series of twenty-six patients in whom stripping was done without any medicinal induction. Of the twenty-six, fourteen responded immediately by going into labor—something between fifty-five and sixty per cent.

In answer to Dr. Heaney's query about the dose of quinine, he said that in this series it was used in five grain doses repeated hourly for a maximum of three doses, so that the total quinine the patient received amounted to fifteen grains.

In reply to Dr. Holmes's question as to the discrepancy in the figures for bag induction, he said the six per cent that did not respond represented one of the thirty-eight patients. In that patient the cervix dilated to about $4\frac{1}{2}$ cm., the bag came out and the pains stopped. She was left undisturbed for forty-eight hours, and then labor was induced with castor oil, quinine and pituitrin. That has been regarded as a bag failure and is the only one. Of course, only thirty-seven patients delivered.

With the bags Dr. Reed uses castor oil, castor oil and quinine, and some pituitrin. In this series care was taken not to mix the different types of induction. In thirty-eight patients the bag was used alone, and nothing was given in the way of medication to stimulate labor pains.

Dr. Scott asked about the dose of pituitrin. One patient in this series after the second dose of pituitrin showed a mild uterine tetany which lasted about thirty minutes. She was a twenty-seven year old primipara, apparently at term. The cervix was not stretched. She was simply given one minim of pituitrin and following the second minim developed severe lower abdominal pain; the uterus immediately contracted and remained contracted for about thirty minutes. If that result can occur from one minim doses, he would be afraid of three minim doses. The patients made no comment as to discomfort from the number of hypodermics they received.

The bags used in this series were of the larger type of Voorhees' bags. None of the small Carl Braun bags were used. If the first induction was unsuccessful, nothing was done to the patient for forty-eight hours. After that a second induction was attempted. Some were allowed to go over seventy-two hours, but in none was the interval between the first and second injection as long as one week, to which Dr. Culbertson referred.

Dr. Goldstine and Dr. Shutter referred to cases of induction in patients who were not near term. That type of patient was not considered in this series. This study was an attempt to compare the methods at the most favorable time, which is at or near term. The favorable results of any method of induction decrease in direct proportion to the degree of prematurity.

DR. A. F. LASH (by invitation) presented a paper on **The Therapeutic Value of a New Concentrated Streptococcus Antitoxin in Puerperal Fever.** (For original article see page 297.)

DISCUSSION

DR. FRED H. FALLS said he felt that the use of antistreptococcic serum in puerperal fever is a step in the right direction in combating this disease. Interest in this has been aroused by the work of Dick and others on scarlet fever and erysipelas. With this type of serum a result can be expected that is comparable to the effect obtained in scarlet fever and erysipelas rather than the type of reaction that has been observed in diphtheria.

The toxin of streptococcus is not a pure exotoxin but is both an exotoxin and endotoxin. It is important, as Lash has been able to show, that these toxins produce exotoxins and that he can produce serum that will neutralize this exotoxin. Another important thing to be stressed is that to be of any value the serum must be administered early. Too often in cases of puerperal sepsis everything else is tried and then when it becomes apparent that the patient is moribund, a frenzied attempt is made to inject every and all kinds of serum that may as a last resort do good. This is not the way to treat these infections. The results, as Dr. Lash has shown, are secured when the diagnosis is endometritis or myometritis. The fact that in these cases he was able to reduce the mortality to about five per cent substantiates this statement. Nobody knows what would have occurred in these injected cases if he had not injected the serum. Everyone has seen patients with streptococcic infection who have gotten well spontaneously, and likewise, there are cases in which streptococci were present in the cervix following delivery and no fever occurred. Therefore, the difficulties of arriving at conclusions in these cases are apparent to anyone who has done this type of work. Only by carefully controlled statistics can conclusions be drawn.

The advantage one has in using antistreptococci serum in puerperal sepsis is that one knows fairly definitely when the disease starts, in the sense that if one has a patient who has had a difficult forceps delivery, a manual removal of the placenta, and the next day develops fever, he can immediately make a smear and culture from the vagina and within a few hours arrive at a diagnosis and use the serum. That is the way serum should be used.

The diagnosis is usually relatively easy in puerperal sepsis as compared with scarlet fever. Pyelitis, breast abscesses, and other causes of postpartum temperature can usually be ruled out easily. The characteristic findings, physical and bacteriologic, in the pelvis clinch the diagnosis. Another advantage as compared with erysipelas is that one is dealing with young individuals not with older people who so often succumb to streptococcal infection. A disadvantage is that one is dealing with individuals who may have had severe hemorrhage.

Further work must be done. He felt that the next step in this type of work should be the taking of alternate cases, so that the results could be compared in the cases in which serum was given and those in which it was not.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

New Books

BY ROBERT T. FRANK, A.M., M.D., F.A.C.S., NEW YORK CITY, N. Y.

OF GENERAL INTEREST

TWO entirely nonmedical books have struck me most favorably. They should interest both the medical and lay reader. The first one dealing with adolescence is surprisingly fascinating, and I refused to lay it aside until I had read it from cover to cover. The second book to be discussed contains a fund of interesting information and is charmingly written.

*Coming of Age in Samoa*¹ is a psychologic study of primitive youth for the benefit of western civilization. This investigation was performed by Margaret Mead, assistant curator of ethnology in the American Museum of Natural History.

Franz Boas who wrote the introduction, says that up to this time hardly any one had taken the pains to identify himself sufficiently with a primitive population to obtain a real insight into its problems. Miss Mead did undertake to identify herself so completely with Samoan youth that she is able to give a lucid picture of the joys and problems of individuals in a culture different from our own. The author is really interested in determining whether the rebellion against authority, the philosophical perplexities, the flowering of idealism, the conflict and struggle so characteristic of our present adolescents were due to the difficulties inherent to adolescence or resultant from being adolescent in America.

As the test colony of Herodotus in which babies were to be isolated and the results recorded is not a possible approach, an anthropologist is forced to go to an entirely different civilization and make a study of its problems under entirely different cultural conditions. She therefore chose a primitive group whose language does not possess our Indo-European categories, whose religious ideals are of a different nature, and whose social organization is not only simpler but very different from our own.

Her study is based upon the adolescent girls in Samoa, and of these she chose all the girls in three little villages on the coast of the little island of Tau. Nine months were spent in Samoa and fifty girls were studied.

It is really difficult to summarize this most interesting book which reads like a novel. These Samoan girls were traced from babyhood through their task of baby tending and their instruction in the making of the oven, the weaving of fine mats, and the forsaking of the gang of children, to become members of the household. The Samoan girl defers marriage through as many years of casual love making and sex

¹*Coming of Age in Samoa*. By Margaret Mead. William Morrow & Co., New York, 1925.

experience as possible, but she finally marries and settles down to rear children who in turn will repeat the same cycle. In Samoa growing up is easy and simple, a part of the general casualness of the whole society. No one plays for very high stakes and no one pays very heavy prices. Disagreements between parent and child are settled by the child moving across the street. Occasionally misfits and delinquents are encountered. Sex is a natural, pleasurable thing. The freedom with which it may be indulged in is limited by just one consideration, social status. Chiefs' daughters and chiefs' wives should indulge in no extra-marital experiments. Samoan civilization discounts strong feeling and its primitive civilization favors tranquillity. In addition there is an almost entire lack of neuroses among Samoans. Difficult situations rarely arise. A low grade moron would not be greatly handicapped in Samoa where the range of variation is small. There is no close relationship between parent and child on the island, and there is a resultant lack of specialized feeling. In other words the home does not dominate and distort the life of the growing child. This lack of specializing of feeling applies also to the sex feeling. No reticence is encountered. The Samoan child sees intercourse, pregnancy, childbirth and death as familiar occurrences.

From the time that Samoan children are four or five years old, they perform definite tasks graded to their strength and intelligence. This does not mean that they have less time for playing than American children. Their tasks have a direct application to adult life, quite different from those of our children. The most characteristic of Samoan traits is the *laissez faire* attitude toward children.

The author says that realizing our own ways are not humanly inevitable nor God ordained but the fruit of a long and turbulent history, we may well examine in turn all of our institutions, thrown into strong relief against the history of other civilizations, and weighing them in the balance, be not afraid to find them wanting. Samoa knows but one way of life and teaches it to her children. Will we, who have the knowledge of many ways, leave our children free to choose among them?

Folklore of the Teeth by Leo Kanner² is a most interesting, well written and stimulating monograph. It is of interest to the historian, the student of folklore and the medical man as well as to the ordinary lay reader. The book is well written and replete with many types of information.

Aristotle thought that men had more teeth than women. Christoph of the golden tooth, who pretended in the 16th century to have acquired this golden appendage through a miracle, shows some of the charlantry connected with ignorance and credulity. Aids to dentition include the Frankonian remedy of biting off the head of a living mouse, the head then being worn in a linen bag. In many localities shed milk teeth are carefully stowed in a mouse hole in order to aid the growth of the permanent teeth.

The hygiene of the teeth has been a subject of importance throughout the ages. "A diamond is not as precious as a tooth" says Cervantes. Every race has prized good teeth. Chewing for the sake of dental hygiene accounts for the use of mastic, betel, and gambin. (I wonder whether our national habit of gum chewing can be placed

²*Folklore of the Teeth*. By L. Kanner. Macmillan Co. New York, 1928.

upon any such useful and excusable basis.) Toothpicks have been found among Hallstattian relics. Among the primitive tribes the siwak may be regarded as the precursor of the toothbrush, the palm stem or similar fragment being used to clean the teeth.

Toothache is generally recognized as one of the worst pains to which mankind is liable. Therefore amulets and charms abound. Kanner mentions with comment 133 plants which have been prescribed by primitive and civilized nations for the cure of toothaches. St. Apollonia throughout the ages has been recognized as the patron saint of toothaches. She suffered her martyrdom 248 A.D. and underwent extraction, pulling, knocking out and mutilation of her teeth and jaws. Among savage tribes transference of toothache, most commonly to some inanimate object such as a tree, is still practiced. Although the Egyptians have been credited with the utilization of false teeth, no mummies substantiating this claim have ever been found. The ancient Romans, however, used false teeth more than 500 B.C. Deformation of the teeth by pointing, filing, and removal are practiced by many savage tribes. Staining of the teeth is also a common practice among them. Primitive as well as savage nations have used teeth as ornaments, as charms and as jewelry.

This scholarly and instructive book is to be highly recommended to all readers interested in history, folklore and customs.

GYNECOLOGY

The fourth edition of Graves' *Gynecology*³ shows a large amount of work expended on this revision and rewriting. This book is large for a medical school textbook but contains a tremendous amount of general and detailed information. In order to make it more accessible to the medical student, Dr. Graves has concentrated the information most important for the third and fourth year student in Part 2, which covers gynecologic disease and is about 500 pages in length.

In the huge amount of such material, only a few high spots can be referred to in this review. In spite of, or perhaps because of, so much minute detail in the chapters on menstruation and ovulation, the average reader will be somewhat confused although I have found many well worth-while points discussed by the author. I would suggest that in the next revision the main theme be brought out with greater clarity, that much of the historical deadwood be removed and that less attempt at giving the entire world's literature be made. Few textbooks will equal the clearness and detail with which carcinoma of the cervix, adenocarcinoma of the fundus, and the radium treatment of carcinoma are taken up. Considerable space is given to the lead treatment of cancer. I know of no textbook in which the discussion of endometrioma and endometriosis is more complete. This same praise applies to the chapter on sterility. The technic of the application of radium to the cervix is carefully given and well illustrated.

The large section dealing with operative technic shows a few but not very important changes and additions. I see that the Schubert operation for absence of the vagina has been added. I hope that the next edition will illustrate the Frank-Geist technic by means of the tube flap which has now proved itself of real value in our work and

³*Gynecology*. By W. P. Graves. Ed. 4. W. B. Saunders Co., Philadelphia, 1928.

which is devoid of all risks which accompany both the Schubert and Baldwin technics. If ever the book requires diminishing of material, I would suggest that the chapters on kidney and rectal operations be omitted and that the portions dealing with the relation of gynecology to the general organism be abbreviated.

I have read this book with a great deal of care and interest and therefore do not hesitate to praise its good points and to point out possible means of improvement. For example, it seems that Figs. 63, 64, and 69, dealing with chronic endocervicitis are unmeaning, and this same applies to Fig. 141 of hydatid mole. Some criticism of other microscopic figures could be made. This does not apply to the excellent gross illustrations made by the author.

All in all, this is one of the best textbooks in any language.

The huge *Biology and Pathology of Woman* by Halban and Seitz⁴ is nearing completion. Only the chapters on "Vitamines" and "Fever During Pregnancy" remain to be published, together with the vital volume containing the complete index. Forty-four separate installments have so far appeared, and it is with the last two, numbers 43 and 44 that I have to deal now.

Hoehne has written on ectopic pregnancy. His discussion covers more than 200 pages and while adequate and complete, adds nothing whatever to our present knowledge of the condition. This is, after all, not surprising, as so much study and such frequent opportunities for clinical investigation are offered by extrauterine pregnancy that clinicians have fully exploited this field. The illustrations used in the great majority are taken from Werth who wrote the chapter on extrauterine pregnancy in the *Handbuch der Geburtshilfe* by von Winckel.

In this same installment are a few pages which complete the article of the late Dr. Hitschmann on malignant chorioepithelioma.

The forty-fourth installment contains an article by J. Fischer dealing with the history of medicine during the 19th century in relation to gynecology and obstetrics. The author has taken up each branch of our specialty, for example, discussing the anatomy and embryology of the female sex organs, the physiology of the genital system, the physiology during pregnancy and of the puerperium in turn. This naturally presents the subject in a somewhat detached and fragmentary fashion but permits the author to do justice to a larger number of investigators and authors than would have been possible if he had tried to give a cross-section of only the most striking achievements. On the whole one feels that Fischer has dealt with care and with as great an impartiality as is possible with the medical history of the last century.

An appendix containing the following articles appears with this same installment: The reticuloendothelial system by Robert Benda, pathogenesis of functional disturbances in the female genital system, that is the pathogenesis of psychoneurosis by Walthard, in which the average reader will have some difficulty in following the text because of the special nomenclature which has arisen in this type of investigation; and finally the new discoveries in the interrelationship between hypophysis and the genital system by K. Erhardt.

⁴*Biologie und Pathologie des Weibes*. Herausgegeben von J. Halban und L. Seitz. Urban & Schwarzenberg, Berlin, 1928.

The clinical lectures on *Tropical Gynaecology*⁵ by Green-Armytage contain some extremely interesting chapters. These lectures cover the author's own experience during eighteen years and might better be called oriental gynecology. Of especial interest are Lecture I dealing with obstetrics and gynecology in the days of the patriarchs, in which a close scrutiny of the Bible has been made, and Lecture II on obstetrics and gynecology in the East, in which the special conditions confronting the practitioner in India are emphasized.

Tetany and osteomalacia are common. Although the infant weight averages 20 per cent below that of the European ($5\frac{3}{4}$ pounds) high craniotomy, embryotomy, and decapitation often have to be done. Fibroids and tumors of all kinds are first seen when they have reached enormous size. Prolapse of the uterus is extremely common. Vesicovaginal fistula likewise is frequent and of such intractable type that only in 62 per cent of the cases can any hope of cure be looked forward to.

Lecture III dealing with disorders of menstruation is extremely fanciful. In sterility the Hobb's treatment, something new to me, namely, the introduction of glycerine into the uterus to promote exosmosis from the endometrium, is discussed. A good chapter is devoted to the use and abuse of the pessary. Another chapter deals with the operative and nonoperative treatment of prolapse. The author's reflections on "gynaecology" are interesting and show wide reading. On the whole this little book contains much good sense and experience, presented in a most attractive fashion. It is well worth reading and shows the disadvantages under which medical men must labor in backward communities, and how these disadvantages can often be overcome by special aptitude and effort.

*Trauma and Compensation in Obstetric and Gynaecological Cases*⁶ by Lindsay is a valuable monograph for the occasional medicolegal witness who has no larger treatise available or opportunity to study medicolegal literature.

The main mass of the book is occupied by instructive case histories to which the short introductions form a guide. The main divisions of the book are obstetrics, the neonatus, and gynecology. This monograph is a valuable contribution to obstetric and gynecologic literature.

Seitz has written a concise, clear-cut, well arranged and valuable monograph on *Differential Diagnosis in Gynecology*⁷ for the practical series on differential diagnosis edited as vol. v by Honigsmann.

The subjects stressed are the personality of the patient, which includes the constitution, the normal or abnormal condition of the internal secretory apparatus, the recognition and evaluation of psychoneurosis, as well as the causes of extragenital diseases. Pain and functional disturbances are taken into consideration, especially disturbances of secretion (fluor and menstruation). Pregnancy is considered in connection with women's diseases, the differential diagnosis, the disturbances of pregnancy, and pregnancy complications being dealt with. Considerable space is devoted to disturbances caused by

⁵*Tropical Gynaecology (Clinical Lectures)*. By V. B. Green-Armytage, M.D. Thacker, Spink & Co., Calcutta and Simla, 1928.

⁶*Trauma and Compensation in Obstetric and Gynaecological Cases*. By D. M. Lindsay. Wm. Hodge & Co. Ltd., Edinburgh and London, 1923.

⁷*Differentialdiagnose in der Frauenheilkunde*. By Dr. Med. A. Seltz. Theodor Steinkopff, Dresden und Leipzig, 1928.

bacteria and parasites. Then the differential diagnosis of neoplasms is discussed. Chapters are devoted to malpositions, malformations, injuries and differentiation of diseases of the genital tract from those of the neighboring structures.

Although the author makes no attempt to deal fully with the literature, there is no excuse for calling Cullen's sign of ectopic pregnancy, the discoloration of the umbilicus, the Hoffstätter-Cullen sign, or to fail to mention Rubin of New York when describing the technic of insufflation. I am also surprised to see that Seitz still features the use of Abderhalden's test for the determination of pregnancy.

Radiologic Investigations in Gynecology by Claude Bécclère⁸ was crowned by the Academy of Medicine. Among the subjects dealt with are pneumoperitoneum and tubal insufflation of which a bare outline is given, the main emphasis being placed on the injections of opaque substances, especially lipiodol.

A careful résumé of the technic is presented and the succeeding portion of the book is mainly devoted to the results. Numerous and good reproductions of radiograms are given. The concluding chapter is devoted to therapeutic deductions.

On the whole I consider the author's attitude toward lipiodol injections far too radical and that he uses it too frequently for safety. The study is critical and instructive but personally I limit the use of lipiodol for tubal diagnosis to cases where impermeability has been determined by the insufflation method.

Pettinari's large monograph⁹ covers the entire subject of *Ovarian Grafts* as well as that of the endocrine action of the ovary. His work was done during three years in Pavia and one year in Paris. Delayed publication has greatly impaired the value of this earnest contribution to endocrine studies as the book appears to have been completed in 1925 and only sees the light of day in 1928. Consequently much of the newer physiology which has appeared since 1925 is not presented in this monograph.

The author says that the graft from monkey to man is still entirely in its experimental stage. More important than similarity of blood groups is the fact that a graft from a youthful woman not from an old one should be utilized. Autoplastic grafting may give remarkable results. In homoplastic grafting only a small percentage of successes can be anticipated. The very valuable contributions contained in this book are obscured by the unwieldy size of the volume.

Horalek has written a monograph on *Salpingitis Isthmica Nodosa*¹⁰ as well as on post-tuberculous adnexal changes. The first 118 pages of the book are written in Tschechik which I confess that I am unable to read, but the succeeding 60 pages appear in excellent German. The frequent coincidence of tuberculosis followed by salpingitis isthmica nodosa is stressed. The illustrations and the literary references are thorough and illuminating.

Blair Bell has given a short, profusely illustrated brochure covering the activities of the *Gynecological and Obstetrical Department of the*

⁸*L'Exploration Radiologique en Gynecologie.* By C. Bécclère. Masson et Cie, Paris, 1928.

⁹*Grefte Ovarienne et Action Endocrine de L'Ovaire.* By Vittorio Pettinari. Gaston Doin & Cie, Paris, 1928.

¹⁰*Salpingitis Isthmica Nodosa.* Von F. Horalek. F. Topic, Prague, 1928.

*University of Liverpool.*¹¹ This department, working in connection with the Royal Infirmary, is a well centralized unit, with modern equipment. The teaching is evidently thoroughly worked up and carefully planned. The department offers for sale over 1100 lantern slides for teachers who are not fortunate in having material at their disposal. Such a department is well able to teach students thoroughly, but too static and fixed teaching equipment and material may lead into a deeply grooved rut entailing the danger of not keeping up with modern advances.

*Sterility in Women*¹² is limited to diagnosis and treatment. The book is a strictly practical monograph which offers little new to the profession. Forsdike says that the first examination should not be made before twelve months of married life have elapsed; and before serious investigation is undertaken, six months more should pass. This is sane advice. He goes up to 300 mm. of mercury with his air insufflation which, to my mind, appears to be a rather hazardous pressure to exert. He favors lipiodol for examination. Of 41 patients with patent tubes, 14 or 34.4 per cent became pregnant after lipiodol injection. It appears to me this would signify that numerous unnecessary injections had been performed on patients who would have become pregnant without further measures. His therapeutic advice includes nothing new. Three salpingostomy patients became pregnant after opening of the tubes, an unusually large number. On the whole, the attitude of this author is sane and fairly conservative. His outlook, however, is strictly mechanistic, too little attention being paid to other factors which so often influence sterility or fertility.

*Technique of Contraception*¹³ by Cooper should prove a very useful book to the majority of medical men whose training in methods of contraception is notoriously incomplete. Again and again patients complain to me that physicians limit their advice to the phrase "you should take care not to become pregnant" but appear unable to give concrete directions for any but the simplest of contraceptive measures. The text is clear cut, carefully written, and quite objective in some ways but the book is padded and would gain by being greatly reduced in compass.

The author claims to base his experience on five years as director of the Clinical Research Department of the American Birth Control League during which time he had the opportunity of seeing 8000 cases. The indications for giving contraceptive advice are mentioned, but these naturally will have to vary according to the state in which the physician practices. Recognizing this fact, the author has concluded his monograph by an abstract of some of the state laws. The requisites for an ideal contraceptive are correctly given but of course we are not at present in possession of a really ideal technic. Cooper advises a combination of the Ramses pessary with a contraceptive jelly containing 1 per cent lactic acid. His statistics are far from being convincing. Of the 916 cases he uses, at least 456 should be excluded before one can even consider the results, because any time of observation shorter than one year for judging the efficacy of a method is ludicrously inaccurate.

¹¹The Material and Methods of the Gynecological and Obstetrical Department in the University of Liverpool. By W. Blair Bell. Sherratt & Hughes, Manchester, 1928.

¹²Sterility in Women. By Sidney Forsdike. H. K. Lewis & Co., London, 1928.

¹³Technique of Contraception. By J. F. Cooper. Day-Nichols, New York, 1928.

I wish also that the author had omitted the testimonial-like quotations in chapter one, although I can well understand how he succumbed to the temptation of quoting the opinion of eminent individuals while birth control is being constantly subjected to criticism from so many directions. From the standpoint of value, this monograph is particularly useful as a technical guide to physicians.

Petit-Dutaillis¹⁴ has covered nearly 500 pages with a hodgepodge of loose thinking, credulity, fine writing and erudition. The author loves and delights in diagrammatic circles, clover leaf forms, and other pseudoalchemistic symbols. He has swallowed all endocrinologic nebuli bait, hook and sinker, adorns them, and presents them in extenso. To take a single example, he speaks of "la symbiose endocrino-symphatico-psychique." En passant he objects to modern tendencies in art, sculpture, novels, etc. He quotes repeatedly the text of Bock which deals with "specific corpuscles" secreted by each endocrine gland. In conclusion there is an appendix dealing with a plastic perineal operation, profusely illustrated. For an amputation of the cervix, sixteen separate sutures are employed. In dealing with the anterior vaginal wall and cystocele, the levators are pictured as brought together in front of the cervix while the fasciae are apparently not dealt with. My own impression from the somewhat diagrammatic drawings, is that what the operator really brings together are the fasciae and not the musculature. Books of this kind do no good but produce lots of harm by encouraging loose thinking and wild theorizing.

OBSTETRICS

DeLee's book on *Obstetrics*¹⁵ has reached its fifth edition. As usual, the author has taken great pains in this revision. I cannot fail to agree with DeLee that the very general hospitalization of lying-in women has not decreased either morbidity or mortality in the small towns, because inadequately trained practitioners, encouraged by a false sense of security in hospital surroundings, attempt surgical obstetric procedures which they are incompetent to perform and often interfere when conservative measures are indicated.

The new edition is fully up to its predecessors in completeness, beauty of equipment and careful presentation. The chapter on prenatal care is excellent. The suturing of the placental site during laparotrachelotomy in placenta previa is a new and perhaps useful measure. This operation, that is, laparotrachelotomy, is greatly emphasized by DeLee. He also mentions the Gottschalk-Portes technic of cesarean section with apparent desire to try it out more fully before recommending it without reserve. His enthusiasm for Kielland forceps is extremely small, advising that it would be in the specialist's armamentarium but that the man behind the gun is more important than the type of instrument employed.

The description of menstruation on which so many theories have been advanced, will bear rewriting and clarifying. In the diagnosis of pregnancy by means of laboratory measures, the test of Zondek and Aschheim as well as of Frank and Goldberger might very well have

¹⁴*Troubles Fonctionnels & Dystrophies en Gynecologie.* By Paul Petit-Dutaillis. Gaston Doin & Cie, Paris, 1928.

¹⁵*The Principles and Practice of Obstetrics.* By J. B. DeLee. Ed. 5. W. B. Saunders Co., Philadelphia, 1928.

been mentioned as they offer greater certitude than any of those described. The term "dysthyroidism" appears to me a misnomer. If thyroid overaction is meant, it should be so stated. If underfunctioning of the thyroid occurs, this likewise can be specifically so labeled. No one has brought proof that the thyroid secretion alters in its chemical constitution.

The popularity of the *Principles and Practice of Obstetrics* by DeLee is fully deserved. I know of no book of equal compass which is better than this excellent treatise.

In addition to *Tropical Gynecology* previously mentioned in this review, Green-Armytage has issued a second edition of his *Tropical Midwifery*.¹⁶ This small volume consists of lectures for the general practitioner, emphasizing especially those features of midwifery which are peculiar to the tropics. The book is short and paragraphed so as to emphasize and make its contents readily accessible. Osteomalacia apparently is a very common disease in northern India. During the last two years, 26 craniotomies and 15 cesareans were necessitated by this disease in the hospital in which Armytage is connected. He calls attention to the fact that the newborn babies of osteomalacic mothers must be treated for calcium deficiency. In the treatment of puerperal sepsis, which is very common, the author employs antistreptococcus serum, quinine, Fowler's position and fresh air. He advocates more local treatment than we are accustomed to approve of. Every aspect of obstetrics is dealt with, and on the whole this small treatise is an excellent guide, intermediate between quiz-compend and larger textbook.

Another monograph dealing with problems in India is entitled *The Causes of Ante-Natal, Natal and Neo-Natal Mortality of Infants*¹⁷ by A. L. Mudaliar. It embraces two lectures delivered under the Elizabeth Mathai Foundation and concerns itself mainly with the hospital statistics of two large hospitals in Madras where, however, over one-third of the entire births of the city are recorded. Indian birth statistics are notoriously incomplete and unreliable. The author covers the various causes producing neonatal death with a great deal of detail without, however, contributing much new to this portion of the subject. He claims that early maternity (i.e., child mothers), while existing in India, is not as common as is ordinarily supposed. Of 64,000 pregnancies, 2 occurred at the twelfth year, 18 at the thirteenth year, 87 at the fourteenth year and 307 at the fifteenth year. The lectures are attractively written and contain many graphs.

Van Blarcom's *Obstetrical Nursing*¹⁸ has reached a second edition. The book contains a tremendous lot of information, but I am sufficiently old-fashioned to wonder occasionally how much a nurse's usefulness is increased by studying and presumably soon forgetting too much theory during her pupil days. It seems that today overemphasis is placed on book-learning with some consequent neglect of practice.

¹⁶*Tropical Midwifery*. By V. B. Green-Armytage. Thacker, Spink & Co., Calcutta, India, 1928.

¹⁷*The Causes of Ante-Natal, Natal and Neo-Natal Mortality of Infants*. By A. Lakshmanaswami Mudaliar. Associated Printers, Madras, 1928.

¹⁸*Obstetrical Nursing*. By C. C. Van Blarcom. Ed. 2, revised. The Macmillan Co., New York, 1928.

A Glasgow Manual of Obstetrics,¹⁹ published in 1924, by Cameron, McLellan, Lennie and Hewitt, covers the entire subject in a very complete, clearly planned fashion with the resultant excellent, didactic textbook. The illustrations, mainly in line, resemble those of the classical Faraboeuf and Varnier.

MISCELLANEOUS

*Blood and Urine Chemistry*²⁰ by the Gradwohl is a very timely treatise for laboratory workers, technicians, and practitioners of medicine. It deals especially with the blood chemistry methods which are so constantly utilized in gauging the resistance of patients to operation and the traumata of life.

Part 1 deals with the technic of blood chemistry, considerable time being devoted to the colorimeter which is the basis for most of the tests. The concluding chapter of this part deals with alkalosis.

Part 2 occupies itself with the chemistry of the urine.

Part 3 takes up the interpretation of blood chemical findings including such methods as sugar tolerance test, the blood sugar curve, its importance in encephalitis, in pregnancy and in diabetes. Some 25 pages are devoted to the subject of acidosis and nearly 100 pages to the question of nephritis.

Part 4 occupies itself with basal metabolism. This book will not only be found to be an adequate laboratory guide but will be of use to older practitioners particularly who have not kept up with every detail of modern advances and who may desire to brush up so as to understand the constantly increasing and changing chemical tests which are being used in modern clinical medicine. Many also will appreciate the footnote references to the literature. Everything is worked out with sufficient detail, including tables and charts so as to be of value to technicians in this field.

Marriott²¹ delivered a series of six lectures to the San Diego Academy of Medicine in 1927, dealing with *Recent Advances in Chemistry in Relation to Medical Practice*. The first five lectures give an extremely good, clear, simple exposition of our present knowledge dealing with such fundamental facts as the atom, the molecule, the phenomena of dissociation, the hydrogen ion, surface tension and osmotic pressure. The topics of acidosis and alkalosis are then taken up; next the chemistry of the blood, foods and metabolism, vitamins and dietetics are discussed as well as a very simple milk mixture for infants. It would have been better if the final chapter on endocrines had been entirely omitted as this is superficial, fragmentary, and inaccurate.

Paul Lazarus edited the *Handbuch der gesamten Strahlenheilkunde, Biologie, Pathologie und Therapie*.²² Two installments of vol. ii are on hand. This is the second edition of the *Handbuch der Radiumbiologie und Therapie*. The venerable Frederick Kraus writes the introduction

¹⁹*A Glasgow Manual of Obstetrics*. By S. J. Cameron, A. N. McLellan, R. A. Lennie and J. Hewitt. Edward Arnold & Co., London, 1924.

²⁰*Blood and Urine Chemistry*. By R. B. H. Gradwohl and I. E. Gradwohl. C. V. Mosby Co., St. Louis, 1928.

²¹*Recent Advances in Chemistry in Relation to Medical Practice*. By W. McKim Marriott. C. V. Mosby Co., St. Louis, 1928.

²²*Handbuch der gesamten Strahlenheilkunde, Biologie, Pathologie und Therapie*. Herausgegeben von Paul Lazarus. Zweiter Band. 1. Lieferung. 2. Lieferung. J. F. Bergmann, München, 1928.

just as he did in 1912 on the occasion of the appearance of the first edition. He regrets that the therapeutic results have not kept pace with the tremendous technical advances. He stresses the results obtained in rickets by means of natural and artificial light. The effect on leucemia by roentgen rays is praised. Lymphogranulomatosis responds most gratifyingly. The final results obtained with radiotherapy upon malignant tumors cannot yet be evaluated.

A number of well-known authors have been drawn upon for the revision. Holthusen discusses the biologic dosage to be used with the rays upon individual tissues, especially keeping in mind the radio sensitivity of normal and pathologic structures. The differences in result due to the quality of the rays must also be taken into account. Other effects are due to the size of the dose, as well as to its chronologic distribution.

Schwarz deals with the stimulation or "reiz" produced by roentgen therapy. He is unwilling to affirm or deny why the ray may exert a stimulus per se although stimulating effects may be obtained indirectly.

Rollier and Reyn speak of the method and technic of heliotherapy and chemical sources of light.

Wintz, whose work in gynecology is so well known, discusses the methods applicable to roentgen therapy. Hohlfelder deals with the fields to be applied while Werner discusses combinations with other therapeutic measures such as sensitization and desensitization. Groedel speaks of the injuries due to radiotherapy and the methods of avoiding them as well as of the legal consequences resulting from injury.

The second installment contains an article by Belot, the radiologist of l'Hôpital St. Louis, upon the roentgen and radium treatment of skin diseases including lupus, a very carefully arranged and well written contribution of nearly 100 pages.

The conclusion of skin diseases is dealt with by Degrais, including the treatment of angiomas, and by Pinch on the treatment of malignant skin lesions.

The subject of gynecology is taken up by three well-known contributors. To Seitz has been assigned the question of roentgen treatment in gynecology, including malignant neoplasms; x-ray castration, both temporary and permanent; so-called stimulating treatment to the ovaries; inflammatory gynecologic lesions, inclusive of tuberculosis of the tubes and peritoneum, and low dosage raying of the diseases of the external genitals. The author then enters into the details of the Seitz-Wintz method of treating malignant neoplasms, especially uterine carcinoma.

Von Seuffert discusses the treatment of malignant gynecologic lesions with radium in contradistinction with the preceding which dealt merely with the roentgen ray.

The concluding chapter is by Lahm who discusses the value of the malignancy index and such criteria as may be used in giving a prognosis based upon the histology of neoplasms.

Four installments of the *Handbuch der Inneren Sekretion*²³ have appeared since my last review.

²³*Handbuch Der Inneren Sekretion*. Herausgegeben von Dr. Max Hirsch. 1. Band. Lieferung 4; II Band, Lieferung 4; III Band, Lieferung 5; III Band, Lieferung 6. Curt Kabitze, Leipzig, 1928.

Vol. i, installment 4, deals with two subjects. R. Jaffé and I. Tanenberg have written a long monograph on the adrenal. While most complete and thorough, their presentation lacks coordination and is therefore extremely difficult to read or review. The authors are inclined to ascribe the adrenal deficiencies noted in anencephaly to the same causes rather than to ascribe the cerebral malformation to lack of the adrenal cortex. They emphasize that the adrenal damage in infection runs parallel with the lipoid solubility of the poison and the cholesterol metabolism. The most recent American literature is not included in their review. In the same installment H. Josephy describes the normal and pathologic anatomy of the vegetative centers in the mesencephalon, in the sympathetic and parasympathetic systems.

Vol. ii, installment 4, contains an article on the physiology of the ovary by L. Adler who, it should be recalled, with Hitschman in 1911 overturned all the well established concepts concerning "endometritis" and introduced our modern conception of cyclic endometrial changes. The author discusses the subject in a very adequate fashion. He accepts my interpretation of the continuation of the action of the follicle by the corpus luteum.

Rosenberg in the same installment deals with the normal and pathologic physiology of the internal pancreas secretion.

Of the third volume, the fifth installment contains an article by Leicher on the internal secretion and diseases of the ear, upper respiratory and intestinal tracts. As far as the ear is concerned, endemic cretinism, acromegaly, otosclerosis, especially in connection with the genital phases, is taken up, a special chapter being devoted to the ear and the sex organs. The same diseases are discussed in connection with the nose and sinuses. The relation between the hypophysis and nasal diseases is dealt with, transnasal operation for pituitary tumor being pictured in detail.

The same author discusses the influence on the larynx, trachea, and bronchi on abnormalities of the thyroid and thymus glands, as well as the laryngospasm in asthma as affected by endocrine disturbances.

H. Hirschfeld has dealt with the subject of internal secretion and blood diseases.

Bingold and Delbanco have written on the internal secretions and skin.

Vol. iii, installment 6, contains the article by Pulvermacher, "Is the Skin an Organ of Internal Secretion?" He answers this question in a rather ambiguous fashion, considering the skin an organ of internal secretion only if we enlarge that concept to include all cells, tissues and organs which influence other structures through humoral channels.

In this installment M. Rosenberg has another extensive article on the pathology of the internal secretion of the pancreas.

Von Szily and Poos describe the effect of the internal secretion on the eyes while the installment is concluded by an article by Kranz on the internal secretions and dentistry. The series is proving to be of great importance, a high standard of excellence being maintained throughout. I have given up the hope of finding a return to the pre-war *Handbuch* with its carefully worked up and really complete bibliography. Times have changed; production has increased at such a rate as to nullify a world-wide bibliographic reference except in an index medicus.

Laquer has written a short résumé of our present knowledge of hormones and internal secretion²⁴ which on the whole, in spite of its brevity, is informing. Naturally in the present state of knowledge, no single individual is fully conversant with every aspect of internal secretion. Consequently the different chapters are somewhat uneven. This short treatise is one of the best written.

The second edition of Cumberbatch's *Diathermy*²⁵ has appeared after an interval of six years and because of the many advances, especially in the design of the diathermy apparatus, has been considerably increased in size. The first half of the treatise is devoted to a full description of high frequency currents, their method of production, the machines employed, distribution of currents, and the resultant heat production in the tissues.

In gynecology, Cumberbatch and his coworkers at St. Bartholomew's Hospital have found that heat production cures urethral and cervical gonorrhea in the course of 3 to 5 applications. Gonococci are no longer found in the tissues, recurrences do not take place and several patients have married without infecting their husbands. In addition to cervical and urethral treatment, heat is applied to the ovaries, tubes and parametrium with a consequent relief of pain and disappearance of exudates. Reports on the other diseases affected favorably by diathermy, such as dysmenorrhea, menorrhagia, etc., are less convincing. The author discusses the use of diathermy in all sorts of diseases such as peripheral neuritis, trigeminal neuralgia, arteriosclerosis with high blood pressure, hemorrhoids, colitis, pneumonia, to quote only a few.

The final chapter contains a description of high frequency currents in surgery. This includes different technics such as fulguration, actual cutting with the diathermy knife, electrodesiccation, etc. This book is a sensible, dignified discussion of this important field of medicine in which the enthusiasm of a pioneer is kept well within the bounds of sound reason and discretion.

The fourth edition of Hertzler's *The Technic of Local Anesthesia*²⁶ has just appeared. The author emphasizes the fact that each case presents an individual problem. I still cannot acquiesce in his counsel not to boil the novocaine tablets at all but simply to drop the tablets into sterile water. The great majority of surgeons will agree with Hertzler in frowning on the use of splanchnic anesthesia.

The book first gives general technics of anesthesia and then deals with special locations throughout the body. This popular monograph is a good general guide. The addition of some good anatomic charts would add to the value of the volume.

Levinson has published a second edition of *Examination of Children by Clinical and Laboratory Methods*.²⁷ This short, concise, well-arranged book deals entirely with methods of examination as well as their interpretation. The new edition keeps well up to the changes which have occurred in the last few years.

²⁴Hormone und Innere Sekretion. Von Dr. Fritz Laquer. Theodor Steinkopff. Dresden und Leipzig, 1928.

²⁵Diathermy. By E. P. Cumberbatch. Ed. 2. C. V. Mosby Co., St. Louis, 1928.

²⁶The Technic of Local Anesthesia. By Arthur H. Hertzler. Ed. 4. C. V. Mosby Co., St. Louis, 1928.

²⁷Examination of Children by Clinical and Laboratory Methods. By A. Levinson. Ed. 2. C. V. Mosby Co., St. Louis, 1927.

The tenth series of *Methods and Problems of Medical Education* published by the Rockefeller Foundation in 1928²⁸ is really a world's tour through the physiologic, pharmacologic, bacteriologic and pathologic laboratories of this world. Any one desiring to find the data for planning such medical workshops will do well to consult its pages.

Vol. ii and vol. iii of the 38th Series of *International Clinics* (June and September, 1928)²⁹ are on hand. Of the huge variety of material dealt with, few lend themselves for review. Bleeding from the non-pregnant uterus; chronic salpingitis; chronic appendicitis by J. B. Deaver contain nothing new. Sajous in a long article, "Rational Endocrinology and Organotherapy as Foundations for Greater Efficiency in Practice," asserts that the adrenals are dominant agents in pulmonary and tissue respiration. Adrenal secretion according to the author converts the hemoglobin into oxyhemoglobin. He even assigns a definite function to the thymus. In contradistinction to this entirely unwarranted assumption, he denies all real endocrine action to the pituitary thereby ignoring all recent well substantiated work.

William P. Smith, in operating upon prolapse of the uterus, favors the interposition operation.

*Cancer and Cancer Research*³⁰ is a brochure intended for the lay public and compiled from articles which appeared in the *Liverpool Daily Post and Mercury*. The Committee bolsters up its claims with a somewhat weak endorsement taken from writings by Drs. Francis Carter Wood, Bloodgood, and Graves. The whole theory is apparently based on the fact that lead is toxic to embryonal cells. The entire brochure is well written and replete with general information but on the whole must be regarded as propaganda for the Liverpool lead treatment.

Selected Abstracts

Obstetric Operations

Gibberd, G. F.: Induction of Labor With Animal Bladders Containing Glycerine. *Lancet* 1: 1325, 1928.

It is suggested that a pig's bladder, capacity of 500 c.c., or a sheep's bladder, capacity of 150 c.c., containing glycerine, supplement the bougie or bag frequently used in inducing labor. The bladders are sterilized and packed in alcohol. The bags are inserted just through the internal cervical os, and then about one-fourth filled with glycerine. As this substance is hygroscopic, the size of the bladder is gradually increased by osmosis.

The possible dangers are infection and harmful effects of glycerine. The glycerine might, with its irritation, produce shock, or increase the uterine contractions, or if enough was absorbed, produce a nephritis.

No positive conclusions are made, and no advantages of this method over similar procedures are indicated.

H. C. HESSELTINE.

²⁸*Methods and Problems of Medical Education* (10th Series). Division of Medical Education. The Rockefeller Foundation, New York, 1928.

²⁹*International Clinics*. Vols. ii and iii, 38th Series. J. B. Lippincott Co., Philadelphia, 1928.

³⁰*Cancer and Cancer Research*. Compiled by a Scientific Committee of the Liverpool Medical Research Organization. Sherratt & Hughes, Manchester, 1928.

De Guchteneere: Medical Induction of Labor. *Bruxelles-med.* 8: 1208, 1928.

Medical induction of labor was attempted in 24 cases. In 15 instances the membranes were intact and of these 12 (80 per cent) responded to treatment. In the remaining 9 cases the membranes were ruptured and all of them responded to treatment. Thus the medical induction was successful in a total of 21 (87.5 per cent) cases.

The technic used in this series consisted in the administration of 4 doses of quinine (sulphate or chlorhydrate) of 0.5 gram, each at half-hour intervals and up to 8 subcutaneous injections of $\frac{1}{4}$ c.c. of pituitrin at half-hour intervals, the first injection being given one-half hour after the fourth dose of quinine. If labor did not begin following the injection of pituitrin, the entire procedure was repeated twenty-four hours later.

In 4 cases it was necessary to repeat the routine once and in one case twice. There were 3 failures. One labor started spontaneously forty-eight hours after the treatment; a second patient was probably not at term, and the third showed vagotonic symptoms.

Quinine and pituitrin strengthen sufficiently the physiologic contractions of the uterus to force the presenting part against the cervix and cause beginning of dilatation. The presenting part then acts as a mechanical stimulus and labor continues spontaneously. For this reason Guchteneere believes that, if the cases where the membranes have ruptured be excluded, only about 80 per cent success may be expected from this method.

He concludes that medical induction of labor is an extremely useful procedure in many cases such as postmaturity, disproportion and toxemias of pregnancy. If it is carefully carried out it is a safe method but accidents may occur.

THEODORE W. ADAMS.

Delmas, P.: Extemporaneous Evacuation of the Uterus at the End of Pregnancy. *Bull. Soc. d'obst. et de gynéc.* 17: 413, 1928.

The author advocates forcible dilatation of the cervix at the end of pregnancy in selected cases. He administers spinal anesthesia, manually dilates the cervix, and performs a version and extraction or if the latter is not feasible, he delivers the baby with forceps. After delivery he injects iodine into the uterine cavity, and if the membranes have been ruptured a long time, he inserts into the uterus a tampon saturated with bouillon vaccine. In addition he gives a prophylactic subcutaneous injection of sulpharsensol.

Of the 40 cases reported, in the author's opinion not one mother died or was injured as a result of the operation, since the one maternal death he attributes not to the procedure but to placenta previa. All the babies which were alive before extraction were born alive.

The entire operation lasts only about fifteen minutes. The dilatation of the cervix consumed from twenty seconds to twelve minutes but the usual duration was three minutes. The delivery of the child never required more than six minutes. The delivery of the placenta usually required from three to six minutes.

Among the indications for the operation are eclampsia, premature rupture of the membranes, placenta previa, and fetal asphyxia. The procedure is advocated for specialists only because in the hands of the inexperienced, harm may result.

J. P. GREENHILL.

Houël and Jahier: Prophylactic Fixation of the Anterior Arm in Performing Version and Extraction in Head Presentations. *Bull Soc. d'obst. et de gynéc.* 14: 214, 1925.

Prophylactic fixation of an arm is an accepted procedure in cases of transverse presentation but no one has ever before advocated this procedure in cases of head presentation. The authors fixed the anterior arm with a sling in all cases of head presentation where version and extraction were to be performed. There was neither mortality nor morbidity for the mothers. Two of the children died twenty hours after birth, one from eclampsia and the other was a blue baby. In all the cases delivery was easily accomplished.

The anterior arm should be fixed in preference to the posterior because an anterior asynclitism, which is more favorable than a posterior asynclitism, is produced. There is then less danger to the perineum.

J. P. GREENHILL.

McGuinness, F. G.: Prophylactic External Version in Breech Presentation. *Canad. M. A. J.* 18: 289, 1928.

The author strongly favors prophylactic external version as a routine in uncomplicated breech presentations to avoid an increased fetal mortality. He does not mention any contraindications to this type of version. According to his report, the dangers of infection and extensive perineal laceration are greater in breech delivery, both in primiparae and multiparae.

He discredits the danger of partial separation of the placenta as well as the possibility of inducing premature labor. The number of cord complications was not increased. Those cases that revert have a repeated external version. Binders were used when necessary.

H. C. HESSELTINE.

Fruhinsholz, A.: A Case of Fetal Death Following External Version. *Bull. Soc. d'obst. et de gynéc.* 26: 409, 1927.

In a twenty-two year old primipara a breech presentation was found in the beginning of the eighth month of pregnancy. Three attempts on different occasions to perform an external version were unsuccessful. Hence, an attempt was made under anesthesia, with the patient in the Trendelenburg position. This was successfully accomplished with ease but the fetal heart tones became slower and irregular. In the belief that this was due to fetal discomfort, an abdominal binder was applied. About ten minutes later bleeding began and continued for part of a day. A few hours later painful contractions started and the fetal heart tones disappeared. The uterus became permanently firm and at the end of forty-eight hours, a macerated fetus was spontaneously expelled. The placenta was small and the cord was inserted marginally. There were no blood clots on the uterine surface of the placenta. Fruhinsholz believes the cause of fetal death in this case was direct pressure of the fetal head on the vascular branches at the insertion of the cord into the placenta. For placental separation to account for the death, there would have had to be an extensive separation and there was no anatomic evidence of this.

The accident which occurred in this case is rare and should not be held against the performance of external version. The author has, in some cases of external version, seen mild bleeding, transient fetal distress or uterine hardening without any serious consequences.

J. P. GREENHILL.

Araya: A Method of Accomplishing Internal Podalic Version in the Absence of Amniotic Fluid. *Semana méd.* 31: 349, 1924.

Araya describes a modified Champetier de Ribes bag used by him since 1905, consisting of an elastic bag of the conventional form penetrated by a rubber tube which emerges through the center of its base. Through this tube normal saline solution is injected into the cavity of the uterus after the bag has been introduced and filled in the ordinary way. This form of bag has been found most useful in cases in which podalic version was questionable either because of insufficient dilatation, lack of amniotic fluid, or both. The author prefers to administer chloral or laudanum by rectum as a preliminary measure, or, in cases of tetanization of the uterus or of Bandl's ring, to anesthetize the patient with chloroform. With the patient in Trendelenburg position the bag is inserted and distended, and then saline solution up to 300 or 500 gm. is run through the tube into the uterine cavity, always in the intervals between contractions. As the bag finally is expelled through the cervix, the hand is promptly introduced into the vagina, and passed into the uterus. With the injected fluid still in utero the version is greatly facilitated. Eight cases are reported in detail where this form of bag has been used. The author believes that it would be of value as a hydraulic method of restoring an inverted uterus.

THOS. R. GOETHALS.

Fernandez: Maneuver to Overcome the Difficulty Caused by Bandl's Ring in Internal Podalic Version. *Semana méd.* 33: 1241, 1925.

Fernandez finds that when version is rendered difficult or impossible of accomplishment due to contraction or retraction of the uterus such contraction is seldom in the form of a clearly defined ring. More frequently there is a more or less generalized contracted state which is, however, most marked at certain regions, e.g., the occipitodorsal region in occipital and face presentations, and at the angle formed either by head and shoulder or between head and trunk in the transverse presentations. Such "rings" or areas of most marked contraction are apt to be torn through in any classical method of version and to result in extensive tears or rupture of the uterus.

The author suggests that after both feet have been brought down if possible, or one foot in any case, the baby's body should be rotated by combined pressure from above and rotation of the fetal pelvis by means of the feet or foot in such a way as to swing the occiput away from the area of greatest contraction into the opposite iliac fossa. Thus, the way is cleared for the head to rise up in the uterus while the fetal pelvis dilates the contraction in its descent.

Seven cases have been successfully delivered in this way by the author and three colleagues.

THOS. R. GOETHALS.

Fischer, G.: Some Observations on Craniotomy at the Woman's Clinic at Lund. *Acta obst. et gynec. Scandinav.* 6: 144, 1927.

During the years 1900 to 1925 there were 42 craniotomies performed at the Lund clinic and three of these on living children. The incidence of craniotomies was 0.18 per cent. In 32 per cent of the cases a contracted pelvis was present. Five of these patients subsequently became pregnant but only one had a normal delivery. Among the 42 patients, 71 per cent were primiparae and the majority of them were over thirty years of age. There occurred not a single maternal death in the entire series but in 57 per cent of the cases there was fever after delivery. In half of these cases, however, fever had been pre-existent before the craniotomy.

J. P. GREENHILL.

Stoeckel, W.: Unsuccessful Obstetric Attempts. *Monatschr. f. Geburtsh. u. Gynäk.* 75: 7, 1926.

The author reviews 55 cases where operative procedures were unsuccessfully instituted in the patients' homes, in an attempt to effect delivery. These patients were then sent to a hospital. The cases are divided into two groups; namely, (1) those in which there were proper indications and correct attempts, and (2) those in which there were false indications and incorrect attempts which necessarily resulted in failure.

In the first group there were a number of operations attempted in the presence of fetal death, and other cases in which fear of destructive operations, such as, craniotomy and decapitation, prompted unnecessary haste with consequent maternal injury.

The second group comprises 39 of the 55 cases and in all of them high forceps operations were attempted which from the outset were doomed to be unsuccessful. In only 2 of these cases were the conditions for a forceps delivery fulfilled. The same was true of the indications for the operations.

Only in 24 of the 55 cases was information obtained concerning the indication for the attempted operation. Even where information was given it was often of such a character as to hide the truth and to mislead the hospital authorities, so that cesarean sections were done where proper information would have revealed the risk of such operations.

Of the 55 children, 25 were born alive and 2 of the latter died shortly after birth from trauma. Four of the mothers died and 20 had a long febrile puerperium.

The chief cause for these mistakes is not lack of skill and experience but false obstetric thinking, the lack of appreciation of the significance of conditions and indications, and of ignorance of the fact that occasionally the life of a child must be sacrificed in the interest of the mother. The teaching that labor should not be hastened must be emphasized again. The author agrees with those who advocate the delivery of a baby with forceps after the head has remained at the outlet for a long time. But all are agreed on the seriousness of high forceps operations. The author values the Kielland forceps highly but believes that they should be used only by an experienced individual.

Another cause for the bad results in obstetrics is inadequate teaching in the medical schools.

J. P. GREENHILL.

Miller, Douglas: The Failed Forceps Case and its Treatment. *Brit. M. J.* 2: 685, 1927.

In a series of 500 emergency admissions to the Edinburgh Royal Maternity Hospital, it was found that in 88, or 17.6 per cent, forceps had been applied and efforts made at extraction without the desired result.

The commonest individual cause of failure was disproportion, being found in about 40 per cent of cases. A posterior position of the occiput was found to be an almost equally common cause of difficulty. A third group comprises cases in which no abnormality of the pelvis was present, the child was of average size, presentation and position were normal. Finally, there were two face cases, one of them a mentoposterior, one brow presentation, and one case of ovarian tumor obstructing labor.

Approximately one-third of these patients were seen by a physician for the first time after the commencement of labor. There were only three failed forceps cases among more than 6,000 patients who attended the hospital antenatal clinic.

Where moderate forceps traction fails to effect delivery, the following question must be answered: (1) What is the nature of the obstruction? (2) Is birth of a living child *per vias naturales* possible? (3) If delivery by the natural passages is contemplated, is immediate intervention in the interest of mother or child desirable or not? (4) If delivery of a living child through the vagina is impossible, do the conditions present warrant or forbid cesarean section?

Seventeen of the 88 patients died, a mortality of 19 per cent. The individual causes of death were: sepsis 12, rupture of the uterus 2, postpartum hemorrhage and shock 2, and eclampsia 1. In addition, in 39 (44.3 per cent) the puerperium was morbid. Few patients escaped without more or less serious laceration of cervix, vagina or pelvic floor. Including stillbirths and neonatal deaths, 46 of the infants were lost, a mortality of 52 per cent.

ADAIR.

Hendry, James: Unsuccessful Forceps Cases (How far can they be prevented by efficient antenatal care?) *Brit. M. J.* 2: 135. 1928.

In estimating how far the cases of "failed forceps" could have been prevented by efficient antenatal care, Hendry shows that almost all of the real abnormalities could have been identified during the course of pregnancy, and particularly in the last month. There is only a very small group of fetal abnormalities of the developmental type which cannot be detected before the onset of labor. Antenatal supervision, however, cannot prevent the too early application of forceps in normal cases.

When abnormalities have been detected they may either be corrected before the onset of labor, as in occipito-posterior, breech, and transverse presentations, or patient sent to a hospital where appropriate treatment can be carried out under the most favorable circumstances at the correct stage in labor.

The antenatal supervision can be efficiently carried out by the family physician in many cases, but there always remains a considerable proportion of cases in which accurate diagnosis of pelvic disproportion or abnormal presentation is difficult. An efficient obstetric service would require well-equipped consultative antenatal centers to which the cases presenting difficulties to the family physician can be referred. Hendry believes that a midwife should not be authorized to undertake the care of any pregnant woman without provision being made for the patient to be examined carefully by a medical practitioner before labor is due.

PROSHEK.

Miller, Douglas: Observations on Unsuccessful Forceps Cases (Causation, Management, and End Results). *Brit. M. J.* 2: 183, 1928.

The unsuccessful forceps case would appear to be largely the outcome of non-observance of one of three elementary rules in regard to forceps operation. First, that forceps should not be applied in the presence of marked disparity in relation to the head and pelvis, and rarely, if ever, when the head is still movable above the pelvic brim. The frequency with which it was found that forceps delivery had been attempted while the head was still unengaged would indicate that the difficulty and danger of the high forceps operation are not sufficiently appreciated. Secondly, that forceps should not be applied without an exact knowledge of the position which the head occupies in the pelvis. The initial mistake in unsuccessful forceps cases is so frequently one of diagnosis that it would appear necessary to re-emphasize the wisdom of the time-honored dictum "chloroform and the whole hand" as a preliminary to forceps application. The third essential is that the cervix should be completely effaced and retracted over the presenting part.

PROSHEK.

Shaw, William Fletcher: Unsuccessful Forceps Cases. Brit. M. J. 2: 188, 1928.

In teaching clinical obstetrics special emphasis must be laid upon certain sections of the work, and if this is done the graduate of the future will be turned out capable of taking charge of normal cases, of recognizing abnormalities, and of treating the minor ones, and with a sound clinical foundation upon which to build with future experience. The following four topics are of importance and require special emphasis: antenatal work; antisepsis; first stage of labor; and importance of making a definite diagnosis before applying high forceps.

PROSHEK.

Schockaert: On the Application of Forceps in the Superior Strait. Bruxelles-méd. 8: 708, 1928.

Undoubtedly the scope of cesarean section has been widely increased with the improvement of asepsis and technic. The low cesarean has even increased this field so that the operation can be applied in even potentially infected cases. However, there are cases of moderate disproportion when the woman has been in labor a long time, the membranes have been ruptured for many hours and the amniotic fluid infected, when one hesitates to do even an extraperitoneal cesarean. It is in these cases, where the fetus is still living, that in Schockaert's opinion the use of high forceps should not be entirely disregarded.

THEODORE W. ADAMS.

Franqué, O: Evil Results of High Forceps Operations (Rupture of the Uterus, Air Embolism, Separation of the Pelvis, Lacerations of the Bladder) and Their Prevention. Med. Klin. 24: 401, 1928.

The author relates a series of cases in which extensive damage followed the application of high forceps. The first case was one of rupture of the vagina and uterus, and the patient died of peritonitis. The author believes the forceps operation was unnecessary and the patient's life could have been saved if she had been taken to a hospital before the forceps were applied. The operation was performed because of irregularity of heart tones due to the use of pituitary extract. The second case was one of air embolism after extensive injury to the cervix, and this patient also died. The third case was one of rupture of the symphysis during a high forceps operation. In the fourth case, there was not only a rupture of the symphysis but also a laceration of the bladder. This patient had a cephalo-pelvic disproportion and a cesarean section should have been performed.

The author emphasizes that high forceps should be used only when there is serious danger to mother or child and a version and extraction cannot be performed. There must be no disproportion between the fetal head and the pelvis and the head must not be floating above the inlet. In the home, if the operation does not progress favorably, one dare not resort to excessive force but must perform a craniotomy. The latter operation is indicated if the head does not descend after ten to twelve powerful contractions. The obstetrician should use one type of forceps for all his operations and not burden himself with a new type of instrument every few years.

J. P. GREENHILL.

Varo, B.: Forceps Applied to the Breech. Monatschr. f. Geburtsh. u. Gynäk. 73: 46, 1926.

The author reports that in his clinic the Kielland forceps were employed to deliver 7 cases of breech presentation. The forceps hold the breech best when

they are applied to the hips, and thus grasp bony prominences, the iliac crests and the greater trochanters of the femurs. When the back of the child is to one side of the mother, such a grasp is impossible with the usual type of forceps, because they cannot be applied in the antero-posterior diameter of the pelvis. Therefore, the Kielland forceps should be used for breech presentations. Proper application of these forceps to the breech is not more dangerous to mother and child than the application of forceps to the head.

J. P. GREENHILL.

Küstner, O.: *The Operative Treatment of Breech Presentation*. Monatschr. f. Geburtsh. u. Gynäk. 78: 379, 1928.

The application of the usual cephalic forceps has been advocated for the delivery of a breech by a number of authors. Küstner, however, feels that these forceps should not be used because they do not fit the breech and, therefore, cause damage. He advocates a specially constructed wide, blunt hook which is applied to the posterior hip. The hook was used in 40 cases and over a period of years was used in from 0.8 to 5.6 per cent of all the breech cases. No mother was lost and all but two of the children who were alive before the hook was applied were born alive. The two exceptions required craniotomy on the aftercoming head. Maternal injuries consisted of 2 third degree lacerations in elderly primiparae and a vesico-vaginal fistula. Fetal damage consisted in two fractures of the neck of the femur and a few skin lesions. The author believes the use of this hook should be taught to students to the exclusion of all other methods.

J. P. GREENHILL.

Zarate, Enrique: *Partial Symphysiotomy and the Symphysiotomy of Frank*. Gynéc. et Obst. 14: 289, 1926.

The author feels that the technic of Frank is complicated and dangerous and that it nearly always entails section of the corpus cavernosum and the ligament of Henle and endangers the clitoris and urethra. The technic outlined by the author differs in the fact that, by an oblique insertion of the knife exactly at the upper border of the fibro-cartilage of the symphysis, the operator actually sections only the fibro-cartilage between the bone surfaces, leaving most of the anterior ligament, all of the posterior ligament and the ligament of Henle, which serve as restraints, when the joint surfaces are separated by distinctly forceful abduction of the thighs. There is a minimum of danger in this procedure and the technic is simplified so that the operation is safe under almost any circumstances. The separation of 5 cm. at the symphysis which the operation allows, will permit the passage of the fetal head in all pelvic contractions down to an obstetric conjugate of 8 cm.

The author believes that this operation should absolutely eliminate the use of high forceps and restrict the number of cesarean sections for pelvic contraction. It can be done so rapidly and simply as to be of value in delivering the aftercoming head, and is easily accomplished in the home.

GOODRICH C. SCHAUFFLER.

Fossati: *Permanent Enlargement of the Pelvis*. Annali di Ostetricia e Ginecologia 46: 611, 1924.

Seven cases of partial symphysiectomy are reported in this article. All were primigravidae with flat rachitic pelves, true conjugates varying from 7.8 to 8.2 cm. Operation was done during labor in 4 cases; twenty days antepartum in

one; and as addition to abdominal cesarean in two. Babies weighed from 2900 to 3720 gm. Of the five delivered through the vagina following the operation, one baby was expelled spontaneously, stillborn; on one craniotomy was done because of disappearance of fetal heart tones and rigidity of maternal tissues; two babies could not be resuscitated following forceps delivery; one born by version was living and healthy. The two born by cesarean were in good condition.

The first case of the series suffered a diastasis of symphysis without injury to bladder as result of difficult forceps delivery. The fourth case caused trouble during operation by bleeding extensively from prevesical venous plexus; although her baby was delivered stillborn, spontaneously, five hours after operation she gave birth spontaneously 3 years later to a healthy baby weighing 3320 gm.

Operations for permanent enlargement of the pelvis comprise two types, partial symphysiotomy (Costa), and resection of the promontory (Rotter-Schmid). The two operations may be combined in the same case. Author believes that with a true conjugate of 8 cm. partial symphysiotomy is the operation of choice save in those cases where an acute projection of the promontory is the sole cause of the shortening; where the conjugate is between 7 and 8 cm. the two operations are best combined in order to avoid removal of too much of the promontory. These operations properly used offer the advantage of bringing about a permanent enlargement of the pelvis and they should be performed in connection with the cesarean section.

THOS. R. GOETHALS.

Schmidt, W. Th.: A Successful Case of Hebstectomy with an Auto-Transplantation Between the Severed Ends of the Pubic Bone. *Monatschr. f. Geburtsh. u. Gynäk.* 68: 96, 1925.

A left-sided hebstectomy was performed on a twenty-six year old primipara. The cut ends of the pubic bones were kept about 6 cm. apart with a special dilator and the child was extracted with forceps. Then about 3.5 cm. of the upper part of the left pubic bone was removed and the excised piece of bone placed between the ends of the pubic bone at the hebstectomy incision. The muscle attachments previously freed were sewed to the transplant and the wound closed. The patient had a stormy convalescence for a week, and fistulae developed in the wound. Despite this, the patient was permitted to walk. The fistulae closed but one reopened again several weeks later and pieces of bone were removed from it. At the site of the transplantation there was a strong bony bridge. The patient subsequently became pregnant and after a three-hour labor, spontaneously delivered a baby which weighed 8 pounds. The first baby had weighed 6¾ pounds.

J. P. GREENHILL.

Odagesco, S.: The Results of Expectant Treatment in Contracted Pelves and the Test of Labor. *Rev. franç. de gynéc. et o'bst.* 19: 493, 1926.

In the author's clinic it was found that when women with contracted pelvis were given a test of labor, 70 per cent delivered spontaneously. In the remaining 30 per cent no bad results were noted because of the test of labor and this was due to the fact that in many of these cases the low, cervical cesarean section was performed. This type of cesarean section is the operation of choice even in unclean cases.

From 1921 to 1926 at the Tarnier clinic, 70 women with contracted pelvis delivered spontaneously. In 8 cases a pubiotomy was done and in 4 cases a symphysiotomy. In 5 of these 12 cases serious complications occurred. Eighteen cesarean sections were performed of which 5 were classic and 13 low, cer-

vical. Among the latter cases labor had lasted from twelve to forty-eight hours and the membranes had been ruptured from three to twenty-two hours.

All the patients recovered and all the babies were alive. A comparison of pubiotomy, the classic cesarean section, and the low, cervical operation clearly showed the superiority of the last named.

J. P. GREENHILL.

Titus: Episiotomy and the Immediate Postpartum Repair of Both Old and New Perineal Injuries. *Am. J. Surg.* 3: 499, 1927.

Titus advocates episiotomy preferring the median incision to the lateral. He claims for it less injury to the muscle and better approximation. A number of excellent drawings illustrate the technic. Immediate repair is made of any laceration of the perineum. In multiparae with posterior vaginal and perineal relaxation a gynoplastic repair is made at time of subsequent delivery, especially if there is an abrasion of the *mucous membrane*.

More extensive gynoplastic work on the cervix or the bladder floor for chronic lesions is a dubious procedure at the time of delivery. Likewise, such operations during the early puerperium offer little advantage over a secondary repair at a later date after involution is complete.

WILLIAM KERWIN.

Bucura, C.: The Constitutional Indications For Episiotomy. *Wien. klin. Wehnschr.* 37: 387, 1924.

The author agrees with v. Jaschke that prolapse following childbirth cannot be explained on a mechanical or traumatic basis alone, and believes that every case presenting such pathology has, as an underlying factor, an inferior development with weak and underdeveloped tissues. As proof of this theory, he cites the many cases of prolapsus uteri found in nulliparae and even in virgins. There are two factors concerned in the development of prolapsus: (1) the trauma, and (2) which is the more important, the inherent failure of the supporting tissues to fully develop. The latter cannot be corrected, and massage and gymnastics will not induce full development. Prolapse, however, is prevented to a great extent if the factor of trauma can be eliminated by preventing any overstretching of the birth canal. This can be done by a deep incision extending as high as possible up the birth canal. "Episiotomy should, therefore, be performed in all cases of infantile, asthenic and inferior genitalia not as taught in the textbooks when rupture of the perineum is imminent, but at the time when overstretching is first threatened." The author believes that such a routine procedure would prevent many cases of prolapsus. When performed correctly there is no trauma to the tissues and a careful anatomic repair will restore the parts to their original construction. The author has used this method for fifteen years and states that he has seen no failures, either primary or secondary, even though many cases have gone through repeated labors. He stresses the importance of the exact indication and of the time of performing episiotomy.

RALPH A. REIS.

Correspondence

Routine Removal of the Appendix in All Abdominal Operations by a Suitable Technic.

To the Editor: Twenty-five years ago in an article contributed to the *Cincinnati Lancet-Clinic* I was the first, I believe to urge the routine removal of the appendix when it could be readily reached during an abdominal operation. I had previously made a careful study of the appendix in 636 cases in which it had been thus removed. Of those 636 cases the appendix was found thickened in 126; adherent to the intestines in 90; to the gall bladder in 4; to the omentum in 3; to the ovary in 30; to the fallopian tube in 36; partly obliterated in 65; club-shaped in 63; constricted in 22; thickened and swollen in 116; containing fecal concretions in 13 (3 concretions in one case, 5 in another and a seed in a third); cystic in 2; twisted upon itself in 23; atrophied throughout in 16; *apparently* normal in 27. During the period covered by those 636 cases, I operated on seven cases of acute appendicitis in which the abdomen had been previously opened but the appendix ignored and since then have removed a large number of appendices thus left behind.

Shortly after the publication of that paper Dr. Howard Kelly published an article in which he disapproved of such routine removal; but I note with satisfaction that in the preface to the last edition of his *Gynecology*, just published, in mentioning the improvements which have come into our work during the intervening years, he speaks approvingly of "extirpation of the appendix" in connection with other abdominal operations.

After many years of apparent acquiescence in this view, and the evident widespread adoption by surgeons of the idea of such removal, it came as a great surprise and distinct shock that Dr. J. O. Polak, in his "Study of Mortalities" (*AM. J. OBST. AND GYNEC.*, 16, 600, 1928), should state that such "routine removal adds to the morbidity and often to the mortality." The feeling of surprise was not lessened when Dr. Baer of Chicago voiced his approval of the view in the discussion which followed the reading of the paper.

Correspondence with these surgeons has shown, as suspected, that the technic used in the removal of the appendix might readily account for the alleged morbidity and "often" mortality.

During the twenty-five years since my article appeared in the *Lancet-Clinic*, I have done such routine removal of the appendix not less than 10,000 times, and my associates have so removed it in many other thousands of cases. In my own work I have not had a single instance in which I could attribute any morbidity and certainly no mortality to such removal, and my associates assure me that with them has there been no positive suggestion of any increased morbidity and no mortality. The method of removing the appendix which I have used is so simple and prolongs the operation by such a negligibly short time that I cannot conceive of its being responsible for any form of subsequent trouble. Of course in desperate cases in which the loss of even a few moments might jeopardize the life, no surgeon would pay any attention to the appendix unless he had positive reason to believe that it was an integral part of the trouble for which he was operating.

In all suitable cases of gall bladder surgery and of right inguinal hernia, I remove the appendix if within reach. If the appendix is high up I do not enlarge the hernial opening for the purpose of removing it unless there is a history that it has been a source of some trouble.

The technic used in my thousands of cases is as follows: (1) The appendix and adjacent portion of the cecum are brought into view, and the cecum is so held by

the fingers of an assistant with a piece of gauze. (2) With a hemostat the meso-appendix is transfixed at its base, a catgut ligature withdrawn, and the mesoappendix ligated at its base and severed just beyond the ligature. (A second or third ligature is used if the mesoappendix is unusually broad.) (3) With a chromic catgut ligature the appendix is tightly tied close to the bowel, the ligature held taut with the thumb and forefinger, a hemostat applied just beyond the ligature to retain the contents of the appendix and the appendix severed with scissors so as to leave a safe "button." (4) With a small probe dipped in pure carbolic acid the mucous membrane and the edges of this button are thoroughly sterilized. The surplus acid is wiped away, and frequently the mucous membrane comes away with the wipe as it has been separated by the tight ligature. Particular care should be taken that the carbolic acid is worked down to the very bottom of the projecting button. The ligature is then cut short and the cecum dropped.

By the above technic it will be noted that at no time does the interior of the appendix come in contact in any way with the incision, nor is the cecum released until after most effective sterilization of the inside of the button, so that infection has been absolutely excluded from start to finish. Furthermore, there is no devitalized tissue, the result of the use of the actual cautery or crushing clamps, left behind for nature to care for. The prudent operator will, of course, in the rare cases in which an unusual amount of raw surface is exposed, whip the peritoneum over for protection, but such is entirely unnecessary for the small surface usually left. (A good many years ago, following the dictum of the late Seneca D. Powell, I thought it necessary to "neutralize" the carbolic acid by alcohol, but on the appearance of the article by Clark and Brown in the *J. A. M. A.* of March 17, 1906, in which it was demonstrated that alcohol was in no sense a neutralizer, I abandoned this step of the operation as a waste of time and alcohol.)

I have reopened the abdomen for one purpose or another in a considerable number of cases in which such routine removal of the appendix had been previously practiced, and in not a single instance was there the slightest evidence that such removal had been a source of any trouble whatever.

The operative technic, which I think has been responsible for all the morbidity and mortality attributed to the routine removal, constitutes in itself a more or less complicated operation. Usually by this technic the appendix is ligated and cut away, and the stump is treated by the actual cautery or by carbolic acid and alcohol; then the operator passes a purse string around the stump about one-half inch distant, pushes the stump down and then ties the suture. He has thus buried the stump in a moist and warm crypt *which constitutes an ideal incubator for the rapid production of microbes*. At the same time his suture has necessarily cut off a part of the blood supply to the piece of cecal wall which it encircles. The needle wounds which he has made through the peritoneum and muscularis afford a number of minute points for the possible escape of bacteria with resulting infection, and perhaps even the mucous membrane itself may have been penetrated by the needle or by the suture following. Furthermore, the operation consumes a very appreciable length of time. (Inversion of the open stump of the appendix with closure with purse string [Dawbarn's method] obviates the menace of the incubation chamber but does not prevent the possible escape during the manipulation of some intestinal contents; while several deaths from hemorrhage have been reported.)

Surgeons who use the above method should certainly read those illustrated pages in *Operative Surgery* in which J. Shelton Horsley shows the imminent danger of this procedure. They should also read the equally vigorous condemnation of this method by Franklin I. Harris of San Francisco, published in *California and West Med.* 27, 69, 1927. It does not seem possible that any surgeon would consent to employ such an elaborate and dangerous technic after reading these two articles when a different procedure with its beautiful simplicity and rapidity seems to meet all the

objections that can be urged against the other. Certainly in a suit for malpractice resulting from the unfortunate termination of such technic, the defendant would have considerable difficulty in overcoming the presumption against him established by the prosecution.

So far as known, the appendix is simply a vestigial organ, absolutely without function but distinctly responsible for much morbidity and for many thousands of deaths annually. It would seem, therefore, to be almost criminal for an operator with the abdomen open before him to leave the appendix behind, particularly in young people, in any except the most unusual circumstances. Even with older patients the danger of subsequent appendicitis is not to be ignored. I recall one case of acute appendicitis with abscess formation in a man of 84, with recovery, and another at 76 but with extensive adjacent involvement and fatal issue.

On one occasion I accidentally entered the operating room of a colleague just as he had reopened the abdomen because of the advent of acute symptoms three or four days after his removal of an appendix, and there saw that the *encircled piece of cecal wall had sloughed out* with outpouring of fecal contents and early death. Shortly afterward I was told of a similar case in the same hospital, as found at autopsy.

The "blowing off" of the ligature has been mentioned by those who resort to the more complicated procedure, but such an occurrence is to me inconceivable and has certainly never appeared in any of the thousands of cases which have come under my personal supervision and cognizance.

J. F. BALDWIN, M.D.

115 SOUTH GRANT AVENUE, COLUMBUS, OHIO.

Injection of Ether into the Uterus

To the Editor.—On page 129 of the July, 1928 issue of this Journal in the Proceedings of the Chicago Gynecological Society there appears the report of a demonstration by Dr. J. B. De Lee entitled, "A means of rupturing the uterus by injection of ether." The means he used to demonstrate the dangers of injecting ether into the uterus does not conform with two well established laws of physics; namely, that the boiling point of a liquid varies directly with the pressure and that the volume of a gas at a given temperature varies inversely as the pressure.

The writer performed a simple experiment as follows: a 10 c.c. bottle was connected by means of a piece of glass tubing through a cork with a sphygmomanometer. Three c.c. of ether were introduced into the bottle, and the stopper was then tightly inserted and the bottle was placed in a water-bath, and the pressure exerted by the expansion of the ether was recorded. At 100° F. the maximum pressure exerted by the ether vapor was 194 mm. Hg. Increasing the temperature would increase the pressure but at each rise in temperature the pressure became constant for that temperature.

Transuterine insufflation of the uterine tubes is a frequent procedure and 200 mm. Hg. pressure is considered perfectly safe even in a closed system. Presumably a pregnant uterus is open at at least two points, cervix and one tube. It is therefore inconceivable that a gas which will exert a maximum of pressure of 194 mm. Hg. could do damage to the uterus. Even granting the presence of blood clots or folds of mucous membrane the pressure is still within safe limits.

As I read Dr. DeTarnowsky's article on producing abortion by injecting ether into the uterine cavity it did not seem to me that the expulsion of the fetus was due to the explosive force of the ether vapor, but that the ether acted as a uterine irritant which caused expulsion of the fetus. If the desire is to "blow" the fetus out of the uterus, T.N.T. would be much more efficient than ether.

L. M. MILES, M.D.

WACO, TEXAS.

Books Received

EPIDEMIC ENCEPHALITIS IN ASSOCIATION WITH PREGNANCY. By Frederick Roques, obstetrical and gynecological registrar, the Middlesex Hospital, etc., London. Published by Sherratt & Hughes, Manchester, 1928.

THE CAUSES OF ANTENATAL, NATAL AND NEONATAL MORTALITY OF INFANTS. By A. Lakshmanaswami Mudaliar, assistant superintendent, Government Hospital for Women and Children, Madras, India. Printed by Associated Printers, Madras, 1929.

ANNUAL REPORT OF SURGEON GENERAL OF THE PUBLIC HEALTH SERVICE OF THE UNITED STATES. For the fiscal year 1928. Government Printing Press, Washington, 1928.

INJECTION TREATMENT OF INTERNAL HEMORRHOIDS. By Marion C. Pruitt, associate in surgery, medical department, Emory University, Georgia Baptist Hospital, and Grady Hospital, etc., etc. Illustrated. St. Louis, C. V. Mosby Company, 1929.

INTERNATIONAL CLINICS. Volume IV, Thirty-eighth Series, 1928. Philadelphia, J. B. Lippincott Company, 1928.

LES ARTHRITES GONOCOCCIQUES. Par Henri Mondor, professeur agrégé à la Faculté de Médecine de Paris. Avec 121 figures. Masson et Cie, éditeurs. Paris, 1928.

GETTING READY TO BE A MOTHER. By Carolyn Conant van Blarcom. Second edition, revised. With 82 illustrations. New York, The Macmillan Company, 1929.

INTERNATIONALE RADIOTHERAPIE. Band III, 1927-1928. Verlag von L. C. Wittich in Darmstadt, 1928.

MEDICAL DEPARTMENT OF THE U. S. ARMY IN THE WORLD WAR. Volume IV. Activities concerning mobilization camps. By Maj. Albert S. Bowen. Washington, U. S. Government Printing Press, 1928.

THE CLIMACTERIC (THE CRITICAL AGE). By Gregorio Maranon, Professor of Medical Pathology in the Madrid General Hospital, Member of the Royal National Academy of Medicine. Translated by K. S. Stevens. Edited by Carey Culbertson, A.B., M.D., F.A.C.S. St. Louis, The C. V. Mosby Company, 1929.

of the disease by using histamin in small doses over a long period of time. In summing up his work Hoffbauer states that there was produced peripheral necrosis of the liver both anemic and hemorrhagic in type associated with the formation of thrombi and bile stasis. He shows several illustrations of these lesions, and if they illustrate the most striking of his findings, one is forced to believe that the lesions produced were not particularly marked or extensive.

The theory I express in this paper regarding the possible means of producing the hepatic lesion experimentally is based on rather different reasoning. In the first place in human pregnancy one is impressed with the fact that the syncytial tissue and chorionic villi as a whole are considerably different from those in the placenta of various



Fig. 2.—Liver of dog. Normal portal space showing branch of portal vein, bile duct, and hepatic artery.

experimental animals, and in the human subject these elements enter the blood quite readily, particularly so in the latter weeks of pregnancy. These elements being protein in nature must be broken up by certain neutralizing substances which most likely are the proteolytic enzymes of the blood. Another fact which has impressed me is that the lesion of eclampsia is a specific one and is primarily produced as a result of thrombosis of the small tributaries of the portal vein in the periphery of the liver lobule; therefore, substances which are concerned in the production of this lesion must be present in greater concentration in the portal system than in the general circulation. These toxic substances, as far as the liver is concerned, must have properties of injuring the endothelial cells or, on ac-

count of the nature of the substance, shorten the coagulation time, or have both properties. Considering this, the most logical assumption is that substances must be absorbed from the intestinal tract. It may be well to mention here the fact that clinically, if a patient undergoes a strict dietary régime in the later weeks of pregnancy with a limitation of proteins from the diet, meat proteins in particular, substituting a diet high in carbohydrates and with a good intestinal elimination emphasized at the same time, such patients rarely if ever develop eclampsia.

Several years ago I became interested in the serologic work of Obata. Obata reported that if normal serum is incubated with saline extract of fresh placenta the latter is no longer toxic to mice if in-

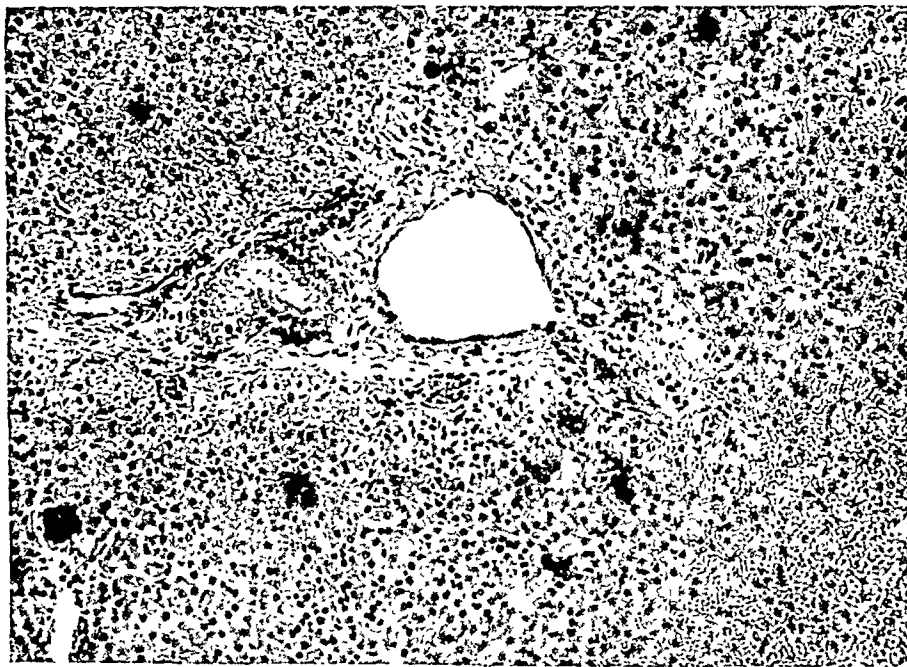


Fig. 3.—Dog No. 10. Liver, showing hemorrhage into connective tissue of portal space as well as adjacent liver tissue with necrosis of liver cells. Comparative early lesion. Lesion most strikingly seen in right lower portion.

jected intravenously. On the other hand the serum of an eclamptic patient obtained during a convulsion or shortly after does not possess this power. After the convulsions have ceased or very early in the puerperium the serum has regained full neutralizing power. I repeated the work of Obata and reported it on two occasions, and I was able to confirm his work in every detail so far as I carried it out. This work suggested to me that the neutralizing substances of the blood in eclampsia were used up or bound and that similar substances of protein derivation which now entered the portal system from the intestine were not broken up or neutralized and, therefore, had the opportunity of shortening the coagulation time in the portal system and resulting in thrombosis in the tributaries of the portal vein. This

idea was further developed by the various publications of Mills on so-called tissue fibrinogen and its effects on the clotting time. Two of these papers are particularly applicable in discussion of the present subject. Mills presented a paper entitled "The Absorption and Excretion Through the Kidney of Complex Protein Substance Tissue Fibrinogen," an abstract of which follows.

The surprising discovery was made that the complex protein phospholipin compound, tissue fibrinogen, may readily be absorbed from subcutaneous, intraperitoneal, or oral administration, and may make its way equally well to all parts of the body. It may even be excreted unchanged in the urine of animals. Given in any of these ways, its specific quickening effect on blood clotting is in evidence in all parts of

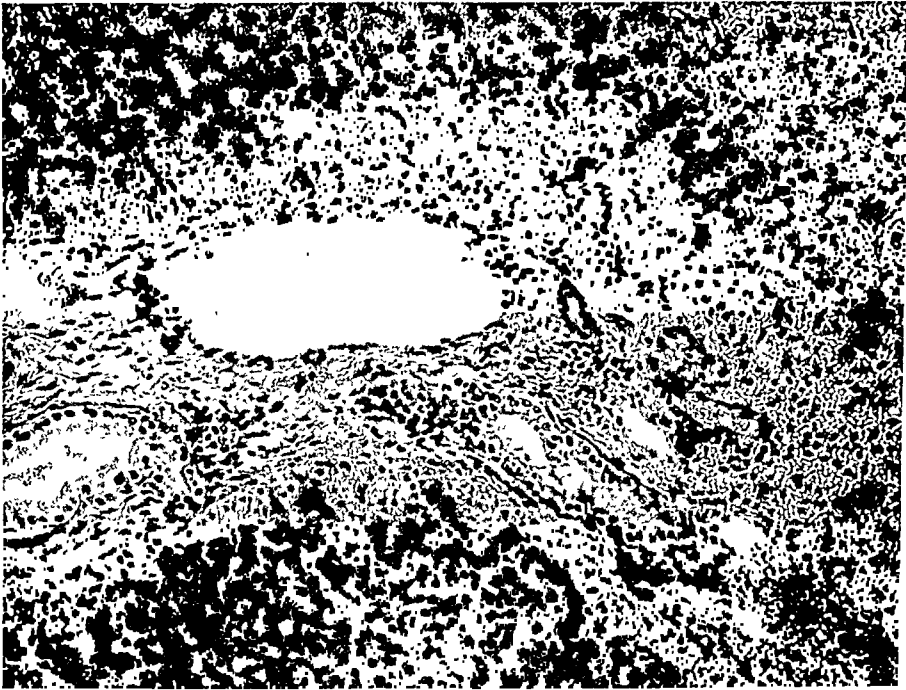


Fig. 4.—Dog No. 10. Similar portal space showing more extensive lesion; hemorrhage and necrosis at the periphery of liver lobule; most marked in right half of picture.

the body, so that hemorrhage at any point is better controlled than by local application of the coagulant to the bleeding area.

Given subcutaneously, the effect of the coagulant comes on in about an hour and lasts eight to ten hours. One c.c. of a 1.5 per cent solution of the substance produces a 40 per cent to 50 per cent shortening in the clotting time of the blood. Apparently no ill effects accompany the use of even enormous doses. However, even very small amounts injected intravenously are very dangerous and are liable to produce intravascular clotting and death.

The results of intraperitoneal injection are similar to those just described above, except that the absorption is more rapid and the effects are over in six to eight hours.

Most important of all, however, is the discovery that the tissue fibrinogen is very rapidly absorbed from the small intestine without previous digestion, being taken directly into the blood and exerting its specific effect on blood clotting within

two to five minutes. When so administered to animals in large doses, it is found to be secreted by the kidneys in its original active form. It must, therefore, pass through the tissues of the body with the ease of a crystalloid substance in spite of its extreme complexity. The ease with which such a colloidal natural body compound permeates throughout the organism at once raises the question as to why the cell colloids do not themselves also diffuse out. The findings here would indicate that they are entirely capable of so diffusing if they are once free but that they are probably held in proper place in the cell by chemical union. In other words the integrity of the cell is not maintained by the nondiffusibility of the constituents present but by their chemical combinations.

The method of accomplishing the successful oral administration of the coagulant to man depends on its rapid passage through the empty stomach and into the intestine before the juices have a chance to act upon it, and on a dilution of these juices by following the coagulant with at least one-half pint of water. Ice water is

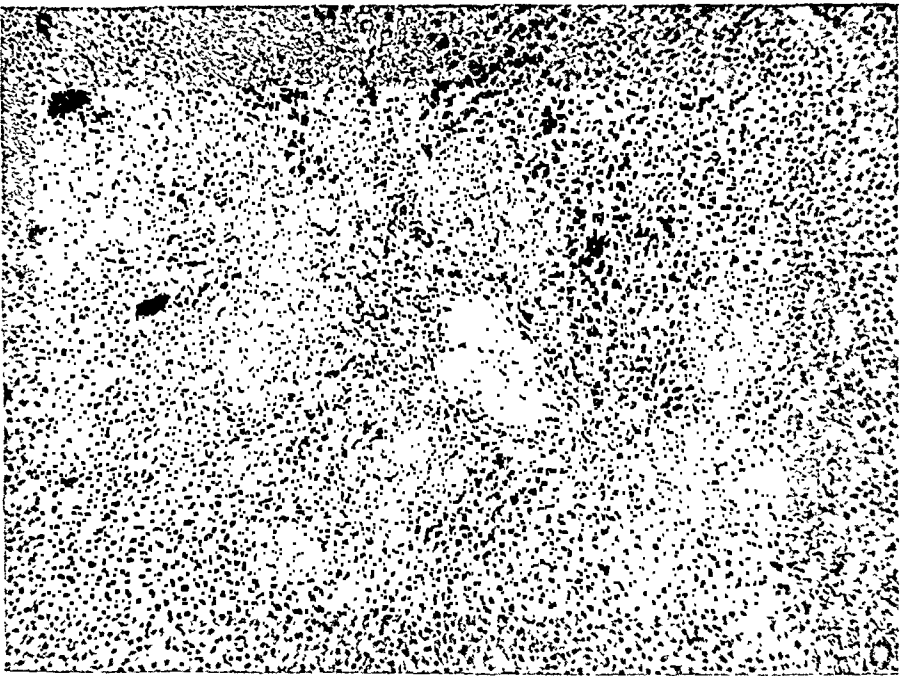


Fig. 5.—Human liver, showing portal space typical of lesion of eclampsia, hemorrhage and necrosis and marked deposition of fibrin around portal space extending from the periphery to the lobule.

preferable as it stimulates active peristalsis, passing the fluid quickly through the stomach and distributing it over a maximum of absorbing area in the small intestine. Larger doses are required when taken orally, and the effect is more brief in duration. The speed of the absorption and the quick effect provide an emergency measure in bleeding cases. If necessary, a more prolonged action can be obtained later by the hypodermic injection. It is obvious that an empty stomach is a necessary prerequisite to successful oral administration. Either the HCl or pepsin of the gastric juice would very quickly destroy the effectiveness of the coagulant.

It is most striking to observe a drop of 50 per cent to 70 per cent in the clotting time within three to five minutes after proper oral ingestion of the substance.

The physiologic questions involved in this rapid intestinal absorption of undigested protein are many. Certainly it opens up a new field for consideration along this line.

The other paper of Mills of particular importance is "Effect of Food Ingestion on Clotting of the Blood"; an abstract of this also follows:

The clotting time of the blood is the longest before breakfast in the morning but shows only slight variations at this time on successive days. It shortens 30 per cent to 40 per cent about an hour after each meal and two to three hours later begins to lengthen. Five or six hours after each meal it will be almost at the same point as on rising in the morning. This clotting time observed before each meal is termed the basal clotting time.

The cause of this effect of food ingestion remains in obscurity. The clotting time bears no relation to the specific gravity of the blood so far as physiologic variations go. Water taken produces no change in the clotting rate; neither does glucose solution nor the eating of plain sugar candy. Coagulated egg white pro-



Fig. 6.—Dog No. 10. Liver, showing fairly large portal space with portal vein and bile ducts, marked hemorrhage and necrosis throughout lower half of picture.

duces no change until about the end of an hour when the typical increase in coagulability of the blood occurs.

The effect on the blood then seems to depend on the presence of the food in the intestine. Whether it is absorbed material that produces the change cannot be said. Acid or alkali ingestion sufficient to markedly alter the reaction of the urine produces no change in the clotting time.

Another fact which is worthy of mention in the discussion of tissue fibrinogen is the fact that the fibrinogen content of the blood is increased in pregnancy, and sometimes very high figures are obtained in cases of eclampsia.

Considering these facts I felt that the lesion of eclampsia could be produced by substances entering the portal circulation from the intestine. Under normal conditions these substances were neutralized or broken up there, but on account of the fact that the neutralizing

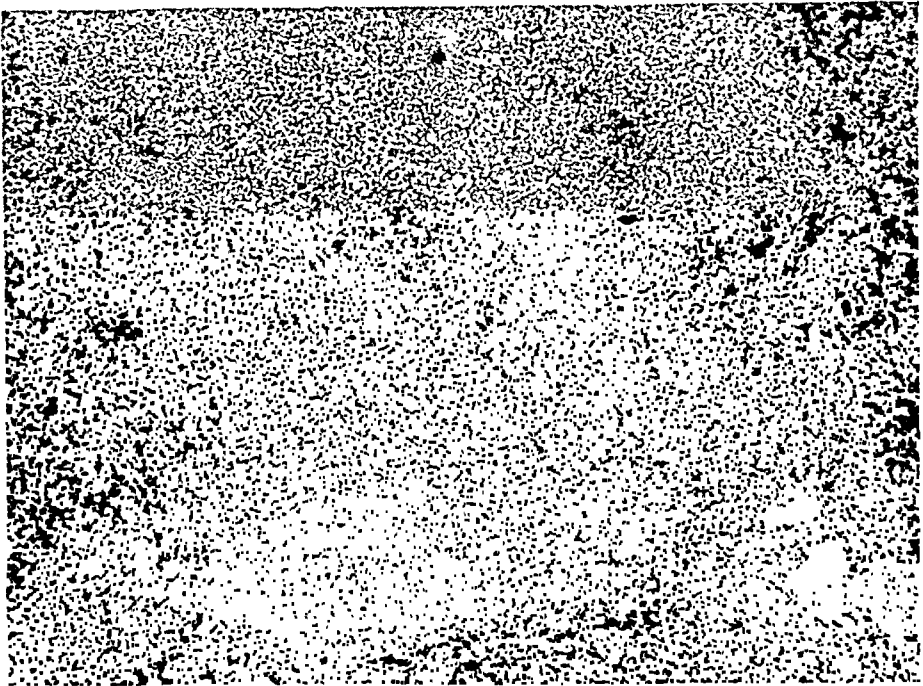


Fig. 7.—Dog No. 10. Liver, showing marked area of hemorrhage and necrosis extending from the periphery of the lobule and involving a large area of liver tissue.

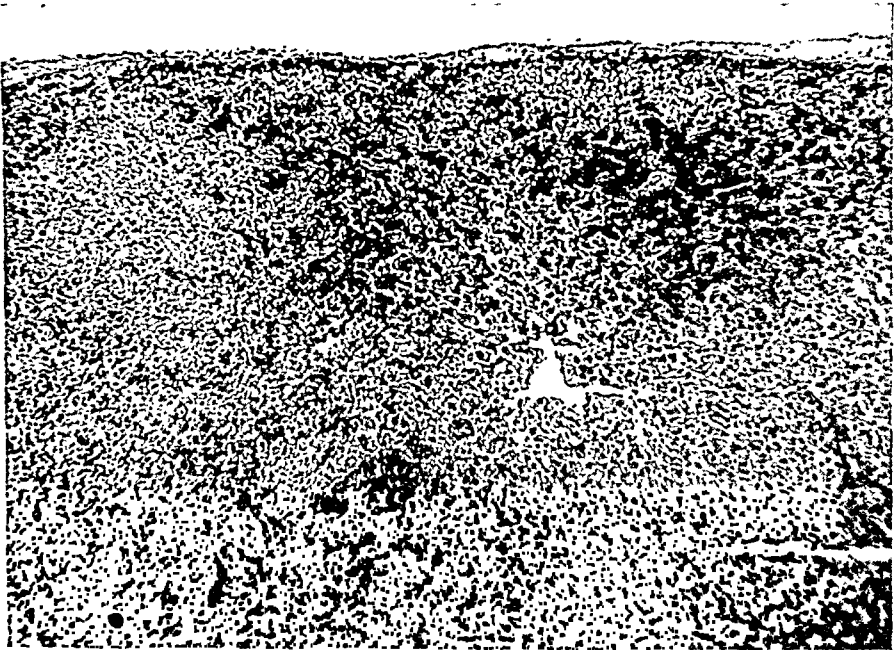


Fig. 8.—Dog No. 10. Liver. Periphery of liver, showing capsule with hemorrhage in capsule tissue and in periphery of lobule with marked necrosis. Large necrotic area in upper left portion of picture, another one immediately below capsule just to right of center.

substances, proteolytic enzymes, if you will, were being used up in the general circulation due to action against constantly entering placental elements, these absorbed substances of protein nature, consisting of tissue fibrinogen or the like, could cause a marked decrease in the coagulation time in the portal system with resulting thrombosis in the portal capillaries.

In carrying out my experiments pregnant animals were not used because the relation of the placenta to the general circulation is entirely different from those in the human subject. As tissue fibrinogen from the work of Mills seemed to have all the properties necessary to simulate the condition which was occurring in human pregnancy as

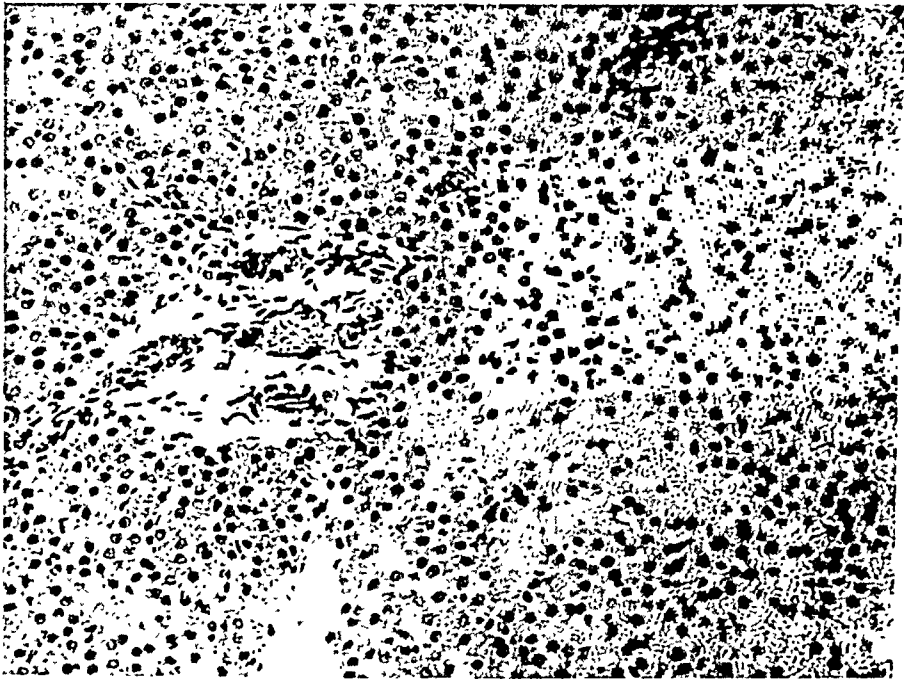


Fig. 9.—Dog No. 16. Liver, showing small portal space with small artery, vein and bile duct. Early lesion. Hemorrhage into tissue of portal space and entering adjacent liver tissue in all directions, more marked on right side where hemorrhage is fairly extensive with considerable destruction of liver cells.

result of protein material entering the circulation, this substance was considered suitable for use. In preparing extracts of tissue fibrinogen myself, I found that the content in the placenta was quite equal to that in the lungs, which indicated that tissue fibrinogen could enter the circulation from the placenta as a source.

I had expected to begin my experiments by injecting tissue fibrinogen in the peripheral circulation and giving it at the same time by mouth. A cannula devised by Blankenhorn to obtain specimens from the portal vein came to my attention, and before trying the oral experiment I thought it was advisable to use the Blankenhorn cannula and to inject directly into the portal vein to see actually what the substance would do under these conditions. Therefore the Blankenhorn

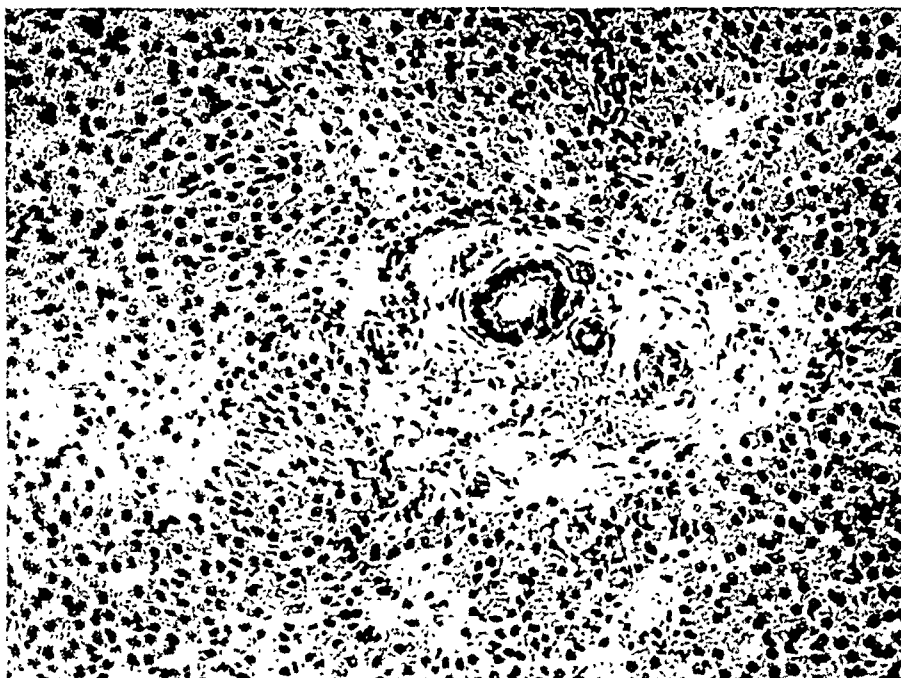


Fig. 10.—Dog No. 16. Liver, showing another small portal space, artery, vein and bile duct with hemorrhage into the interstitial tissue of portal space and extending from it in all directions. Lighter area represents areas of hemorrhage between liver cells. Note irregular contour due to this hemorrhage. Definite necrosis of liver cells.

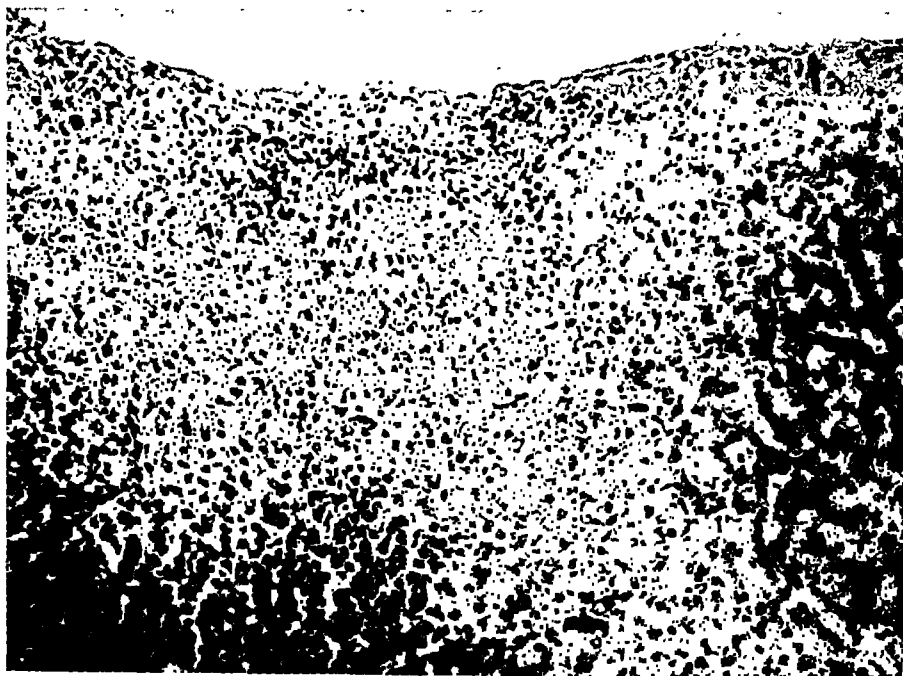


Fig. 11.—Dog No. 14. Liver, showing extensive hemorrhage and necrosis in periphery of lobule under capsule. This lesion was very marked; no lesion around portal space was found in this case because of general thrombosis of portal vein due to overdosage.

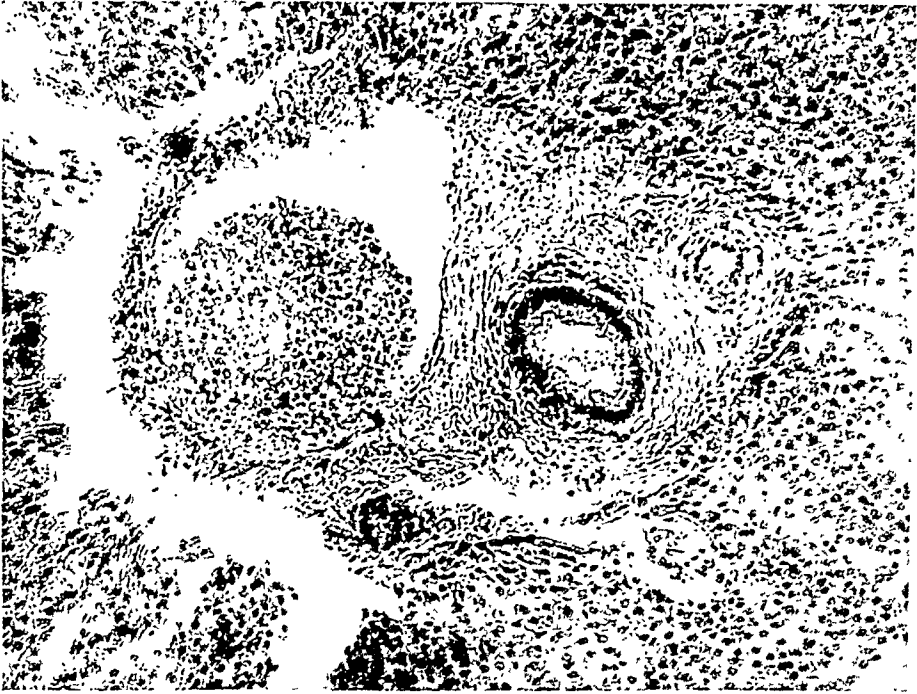


Fig. 12.—Dog No. 14. Portal space, showing branch of portal vein, bile duct and hepatic artery. Marked thrombosis of portal vein. When a thrombosis of this extent occurred further hemorrhage in periphery of lobule was not possible. This was a frequent finding due to overdosage in portal vein. In none of these cases, however, was the portal vein outside the liver involved.



Fig. 13.—A small portal space is seen just above the center and slightly to the left practically completely surrounded by a large hemorrhage. Just below the center and to the right is another portal space in which and from which there is a marked extravasation of blood.

cannula was used for injections of tissue fibrinogen in the portal system at the same time the animal was receiving doses of tissue fibrinogen in the peripheral circulation. The tissue fibrinogen used was that of Merrell made according to Mills' formula.

The dogs were usually anesthetized with ether although amytal was used on a few. Sandbags were placed under the lower thoracic vertebrae to make the portal vein more accessible. A midline incision was made extending up to the xyphoid. The portal vein was easily located and exposed distal to its junction with the splenic vein. Two heavy silk sutures were passed under the vein, and the saddle part of the cannula was tied in place. The skin was separated by blunt dissection for a distance of 2 cm. to 3 cm. away from the line of incision, to a point corresponding to the natural location of the button. The fascia muscle and peritoneum were perforated with a Kelly clamp, and the button was slipped through. It was

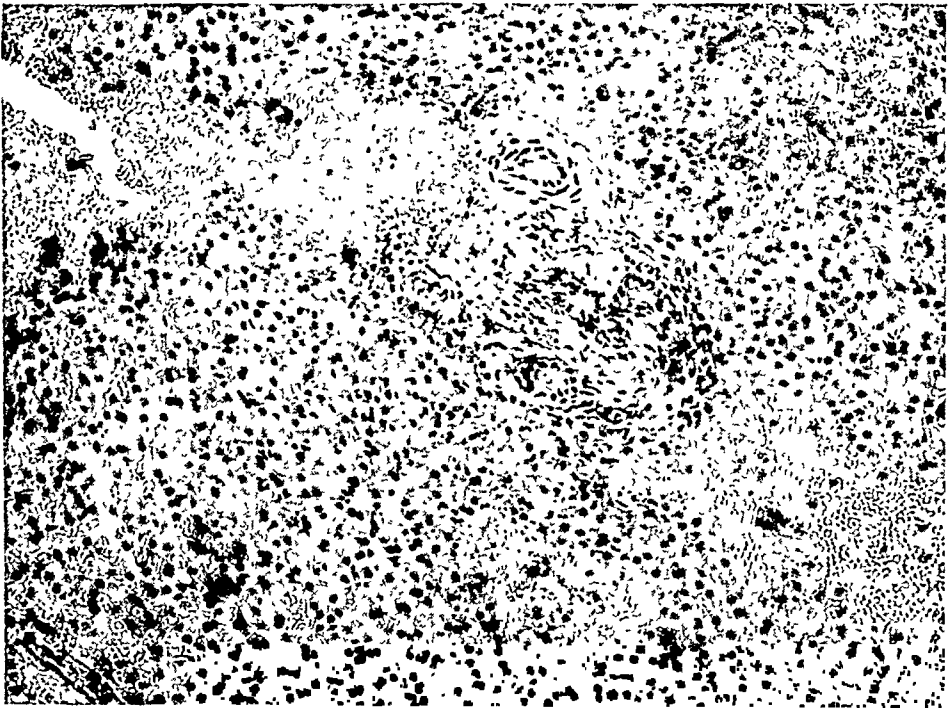


Fig. 14.—A higher power of Fig. 13. Shows lower portal space in Fig. 13 with marked extravasation of blood from it and within the interstitial tissue.

then connected to the saddle, the sandbags were removed and the length adjusted. An injection into one of the small mesenteric veins was made at the time of operation. The closure was in layers, silk being used. For injection the dog was strapped down, tissue fibrinogen injected into the femoral vein and then into the portal vein. Aspiration in the latter was always made before and after injection. The dogs were killed with ether whenever sick or at the end of three to five days. They were autopsied immediately, and the tissue was placed in 10 per cent formalin. The doses of tissue fibrinogen used varied from 2 c.c. to 5 c.c. for peripheral circulation, 6 c.c. to 12 c.c. for portal circulation.

Eight dogs were handled successfully in this way. In three of these dogs extensive lesions were found which in every way simulated the lesion of eclampsia. Dog No. 10 showed this lesion particularly marked, and it is from this case that our illustrations are chiefly taken. The liver showed marked hemorrhage in the periphery of the lobule with extensive necrosis. There were many areas in which

the lesion was found quite characteristically in early stages. The portal vein showed fresh thrombosis, but these were only found in the smaller branches in this case. Dogs, Nos. 14 and 16, from which illustrations are also taken, show early lesions which are quite characteristic. Here the thrombosis of the portal vein was more extensive. I feel this resulted from overdosing and prevented further extension of the lesion by preventing hemorrhage. The remaining five dogs all showed marked thrombosis of the portal vein with some evidence of peripheral necrosis and hemorrhage. These lesions were chiefly found in the periphery of the liver and directly under the capsule. It is interesting to mention in this connection that Fahr quotes Orth and Kauffmann as stating that a thrombosis in the portal vein does not give rise to the eclamptic lesion; this occurs only when the small capillaries of the portal vein are involved in the thrombosis. Overdosing obviously caused this condition in our animals. The description of the lesions produced is given in the legends accompanying the illustrations.

CONCLUSIONS

This work so far as it has been carried shows that tissue fibrinogen, when injected into the portal vein accompanied by injections of the same substance in the peripheral circulation, produces marked portal thrombosis. If the dosage is kept within the limits for the individual dog, a marked peripheral necrosis with hemorrhage can be obtained as three animals clearly demonstrated. I feel that this work so far as it has been carried is very encouraging, and I hope to be able to show that the same condition can be produced by oral administration. I believe these experiments show that there is some real background for my theory, and if by further work I can produce the lesion through peripheral injection and oral administration, this would be sufficient evidence to explain the lesion of eclampsia in the liver and answer the question why the preventive treatment of eclampsia, namely, limiting of protein diet in the last months of pregnancy and good intestinal elimination, has been so effective.*

REFERENCES

- Fahr, T.*: Hinselmann's Eklampsie, Friederich Cohn, Bonn. p. 200. *Bergell*: Hinselmann's Eklampsie, Friederich Cohn, Bonn. p. 426. *Hofbauer*: AM. J. OBST. & GYN. 12: 159, 1926. *Louros and Schmechel*: Arch. f. Gynäk. 129: 1060, 1926. *Dieckmann, W. J.*: Proc. Washington U. Med. Soc. October, 1924. *Dieckmann, W. J.*: Proc. Soc. Exper. Biol. & Med. 13: 589, 1926. *Dieckmann, Wm. J.*: Proc. Soc. Exper. Biol. & Med. 26: 239, 1928. *Obata, Isei*: J. Immunol. 4: 111, 1919. *Obata, Isei*: Arch. f. Gynäk. 119: 69, 1923. *Hayashi, T.*: Arch. f. Gynäk. 119: 505, 1923. *Mills, C. A.*: Proc. Soc. Biol. Chem., J. Biol. Chem. 55: 17, 1923. *Mills, C. A.*: Am. J. Physiol. 63: 484, 1923. *Mills, Dorst, Mynchenberg, and Nakayama*: Am. J. Physiol. 63: 64, 1923.

*Since the presentation of this paper, I reported before the Society of Experimental Biology and Medicine (St. Louis Branch) our results with peripheral injection and oral feeding of tissue fibrinogen.

This report is based on the combination of the peripheral injection and oral feeding of tissue fibrinogen. Seven dogs were fed fibrinogen in 3 ml. doses through a stomach tube and at the same time injected 1 to 5 ml. peripherally. These experiments varied from three to seven days in duration. In seven cases, three showed liver hemorrhage in the gross, similar to that in eclampsia, four showed beautiful eclamptic lesions, and 6 showed portal vein thrombosis within the liver. One was entirely negative. Case 28 is a good example of the combination of peripheral and of oral administration of tissue fibrinogen. The liver in this case showed marked hemorrhages throughout, which extended inward from the periphery of the lobule. This lesion was found in various stages of development throughout the liver, but in most instances it was very marked (See Figs. 13 and 14).

IS SURGICAL INTERVENTION JUSTIFIABLE IN THE TREATMENT OF METROPHLEBITIS AND THROM- BOPHLEBITIS OF THE PELVIC VEINS?*

BY JOHN OSBORN POLAK, M.D., BROOKLYN, N. Y.

(From the Long Island College Medical School and Hospital)

THE answer to this question will depend upon our ability to properly interpret certain clinical and pathologic data which have been observed during the course of these infections, at operation or at autopsy. Furthermore before we decide to elect radical surgical treatment, there are four basic propositions which must be weighed and considered, i.e.:

1. Can thrombophlebitis be recognized by its symptoms and physical signs with sufficient accuracy and at such a time as to warrant subjecting the woman to the added risks of a serious operation?
2. Do the pathologic processes and biologic defenses which are revealed at operation, at autopsy and in the laboratory justify intervention?
3. Are the indications for the operation so clean cut that needless surgery is not done?
4. And finally has the mortality been actually reduced by operation?

Of course it is understood in this discussion that we are not considering that form of thrombophlebitis, known as phlegmasia alba dolens, the treatment of which is established and not debatable. However, such is not the case in septic metrothrombophlebitis (puerperal pyemia) which carries with it, according to the statistics of Sippel, Bumm, Seitz, Seegert, Opitz and others, a mortality which ranges from 50 to 100 per cent. It is apparent therefore that any procedure which offers the slightest hope of increasing the proportion of cures is worthy of discussion and of trial.

If we accept the surgical principle that an infected organ should be removed before the infection spreads beyond its confines, involves the surrounding structures, and reaches the peritoneum or blood stream, it seems reasonable for us to remove or block this focus of infection as soon as the diagnosis is established. However, the difficulty in making a positive diagnosis constitutes one of the chief objections to radical operation.

Infection of the uterine veins is always secondary to intrauterine infection and the bacteria concerned are identical with those found in the endometrial lesion. Hence, there is always a history of a pre-

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ontario, September 10-12, 1928.

existing puerperal endometritis which is followed, when metrophlebitis develops, by the clinical syndrome of repeated chills, fever, and sweats with temperature remissions. The blood culture is usually negative and the white blood cell count, the platelet count, and the polymorphonuclear percentage are commonly low. Bimanual examination of the pelvic organs gives little or no aid, except to exclude the presence of peritoneal and parametrial exudates.

J. W. Williams in his classic paper on this subject claims that the thrombosed veins may be palpated as tender worm-like masses in the broad ligament by rectoabdominal touch. An extensive clinical experience with several hundred of these cases convinces me that the diagnosis must be based upon the history and clinical picture, not on the physical signs, as the tactile sense is seldom able to differentiate the thrombosed veins from coincident parametrial lesions, for there is always some degree of cellular inflammation (periphlebitis) associated with thrombophlebitis. Therefore the diagnosis must depend on the clinical sequence and unless one is familiar with the physiologic and pathologic changes which are taking place in involution and which are retarded by the presence of an endometrial infection, one can hardly appreciate the significance of the symptoms which make up the clinical picture, their sequence or the strength of nature's biologic defenses.

Following the separation and expulsion of the placenta, the placental site contracts and retracts, its area is diminished and the large venous sinuses which have furnished the blood supply for the uteroplacental circulation become plugged with thrombi. As retraction continues and involution progresses, the veins in the uterine wall are obliterated by thrombus formation or new vessels of smaller caliber are formed within the old ones, the original vessel being plugged or lined with thrombus. This aseptic plugging and obliteration may be changed into an infective process by a coincident puerperal endometritis which retards contraction and retraction. The thrombi become inoculated with pathogenic bacteria, identical with those found in the endometrial lesion. These multiply within the clot, erode the intima, liquefy the thrombus and escape into the circulation in droplets of pus or in infected emboli causing pyemia. Their multiplication may be so rapid or the cellular defense of the individual so poor that they reach the blood stream in pure culture without exciting any degree of cellular reaction in the tissues through which they pass. On the other hand if the cellular reaction of the blood is sufficient or the infecting organisms are of low virulence, additional defensive clotting and rapid cell proliferation in the wall of the vein will take place.

Metrothrombophlebitis must therefore be regarded as a defensive reaction against the spread of infection and the periphlebitis dis-

tinctly protective just as is the leucocytic wall and the layer of small round cell proliferation in the basal endometrium and contiguous myometrium which confines an endometrial infection to the uterine cavity. When contraction and retraction are maintained only hemolytic strains of bacteria have the power of penetration.

It is evident from this description that in a relaxed uterus or in the presence of active bacteria, thrombus formation may extend out beyond the uterine wall through the ovarian, uterine, hypogastric, iliac, and femoral veins in nature's attempt to block the bacterial advance by a succession of thrombotic bulwarks. Erosion of the intima not only stimulates thrombus formation but excites a prompt protective tissue reaction in and about the wall of the vein. This observation is supported by the studies of Bardelofer who has demonstrated that the vessel wall provides resistance to the egress of the streptococcus. With the entrance into the vein of certain strains of bacteria, notably streptococci and *Bacillus coli*, there is erosion of the lining endothelium which, as already stated, causes coagulation, clot formation and excites cell proliferation in the wall of the vein and in the surrounding tissues, with a resulting phlebitis and periphlebitis.

Within the clot the bacteria rapidly multiply, liquefy the clot and escape into the contiguous channels only to be blocked again by new clot formations. The multiple small purulent foci found in the inflamed thrombosed veins of the uterine wall and in the venous radicals of the pampiniform plexus are usually surrounded by a more or less well defined cellular tissue reaction, which in many instances is sufficient to limit the infection to the veins of the myometrium and of the true pelvis. Manipulation and operation merely break down this protection and spread the infection to the blood stream. Could we determine clinically just the time when this process is confined to the veins of the uterine walls or when the bacterial advance is temporarily blocked by thrombus formation, distal ligation, extirpation and drainage might save some lives, but on the other hand many women would be needlessly operated upon as nature's defenses are sufficient to effect a cure in many instances. When the infective thrombosis extends to the common iliac, renal and vena cava with the formation of multiple infective emboli, which may be carried to the liver, spleen, lungs, pleura, heart, joints, and brain, it is apparent that any operation is fruitless. It must be conceded therefore that the success of operation, whether hysterectomy or ligation, depends on early diagnosis and must be done before these patients become poor operative risks.

Postmortem studies of the deaths credited to puerperal sepsis show that metrothrombophlebitis is present in over 50 per cent and in

these cases multiple embolic foci in the lungs are almost constant findings. *Early diagnosis made on the sequence and clinical syndrome is therefore all important.*

In nearly all cases of thrombophlebitis some form of intrauterine manipulation has preceded the onset, as for example intrauterine manipulation in the treatment of placenta previa or manual removal of the placenta or curettage of the relaxed uterus for the removal of retained fetal remnants or there is a history that the uterus owing to excessive blood loss, the presence of submucous myomas or coincidental constitutional disease favors bacterial invasion of the clots in the placental site.

Firm contraction and retraction offers the strongest barrier against the extension of endometrial infection and endometrial infection is the most common puerperal lesion. The first symptoms are those of endometritis, evidenced by arrested involution, profuse



Fig. 1.—Section through the left broad ligament. Veins are thrombosed. The supporting stroma is infiltrated with moderate numbers of leucocytes. Necrobiosis of the tissues has commenced.

red lochia, uterine colic (afterpains), with the passage of clots and a moderate pyrexia. These symptoms of endometrial inflammation are soon followed by the clinical syndrome of chills, fever, and sweats with temperature remissions. Repeated rigors indicate bacterial escape beyond the confines of the clot. A rise in temperature to 104° to 106° F. immediately follows the chill. This is evidence of the excessive defensive cellular activity and in turn is succeeded by a sudden remission in temperature to normal or subnormal with a profuse sweat which shows that the venous extension is temporarily blocked by new clot formation. This in a few hours is again liquefied, and the clinical syndrome is repeated. The pulse rises with the temperature but has not the proportionate fall, for the toxemia rapidly weakens the heart muscle and its effect is shown in the pulse. The cellular elements of the blood undergo a rapid destruction, shown in the falling hemoglobin percentage, the rapid diminution of the red cell count, the leucopenia,

and the low platelet count, all of which indicate lowered individual resistance. Anemia and wasting rapidly develop and the woman's prostration becomes extreme, though in the early stage of the disease the patient may feel fairly well and be able to take food in the interval between chills.

In the foregoing discussion we have noted that the diagnosis must be made on the clinical syndrome and also that nature is effecting a barrier to bacterial advance by the cellular reaction in and about the vein. The question is, what are the indications for surgery?

A thorough review of the literature gives us little definite information. The statistics are made up of gross and corrected mortalities, the advocates of early operation using the latter to support their con-



Fig. 2.—Septic thrombus in veins at the placental site. Thrombus has partially retracted from the walls; is comprised almost entirely of polymorphonuclear leucocytes.

tention, while their opponents point to the high gross mortalities in order to justify their conservatism. No one has laid down clean-cut indications which can be followed by the rank and file. We all know that many of these cases recover without surgery.

J. F. Baldwin writes me in answer to my query as to how we may recognize the case that will be benefited by operation. "That diagnostic acumen cannot be transmitted, that his success has been dependent upon his ability to recognize the case which will not recover without surgery. He does a panhysterectomy and has a noteworthy series of successes which in all probability would have been death in less skillful hands. He does not clear the situation for us. Huggins who has long had the courage of his convictions, states "that the case where operation is of value is one which lies between the milder form of the disease where the

temperature and pulse variations are not so wide and where, from the beginning the patient does not show evidence of very serious involvement, and the acute fulminating variety where the progress is rapid and grave, from the beginning. Between these two groups we find a class of cases which is prone to become chronic and where, in about eight or ten days after the onset of the infection one is gravely perplexed as to what will happen from day to day." "It is at this particular time, early in the history of the case, and before the patient has become repeatedly saturated with the infection, and where a certain amount of poison is being thrown into the circulation daily which results in lowering her resistance, that operative treatment should be instituted." Cases which have been ill for more than four weeks in Huggins' opinion, offer little hope from surgery.

While I may be classed among the ultraconservatives, I have felt for many years that there must be some time in the course of the

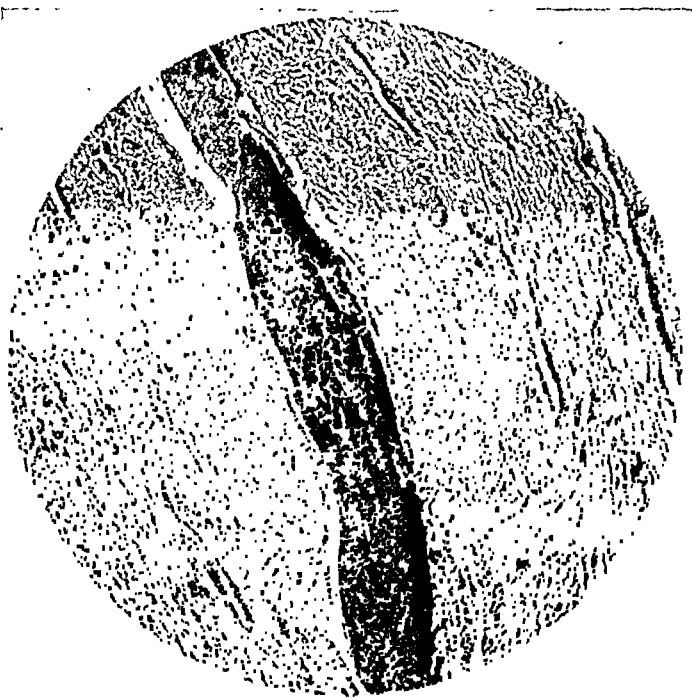


Fig. 3.—Capillary sinuses of uterine wall, 8 mm. from the endometrial surface. The vein is filled by a partially retracted thrombus comprised largely of polymorphonuclear leucocytes; blood cells and fibrin are occasionally noted.

disease when an operation could be successfully performed. In our clinic we have been unable to determine the indications or the exact period at which we should interfere and we are frank to say that we cannot see from the study of reported cases that Baldwin, Huggins or other advocates of surgery present us with any clean-cut indications for operation. It is just the class of cases which these men select for hysterectomy, ligation and drainage which in our clinic recover with small repeated blood transfusions, quinine injections and vaccine therapy. Why these women do get well we do not know, but the fact remains, that more than 60 per cent recover, if all pelvic manipulation is avoided. This point cannot be too strongly stressed. On the

other hand our mortality from operation has been 100 per cent. Of course this may show our ignorance in the selection of cases. The fact that a single vein is involved in the majority of cases, appears to be the chief point of encouragement for the advocates of surgery.

In a study from the literature of 197 cases at the time of operation, but 1 spermatic vein was involved 75 times, 2 spermatics 5 times, 1 hypogastric 6 times, 1 hypogastric and 1 spermatic 6 times, and 1 common iliac was involved 8 times; this shows that in 100 cases in this series, but one vein was involved in 89, while, in the remaining 97 the thrombosis was diffuse. It would therefore appear from this study, that in a little more than 50 per cent of this selected group successful operation was

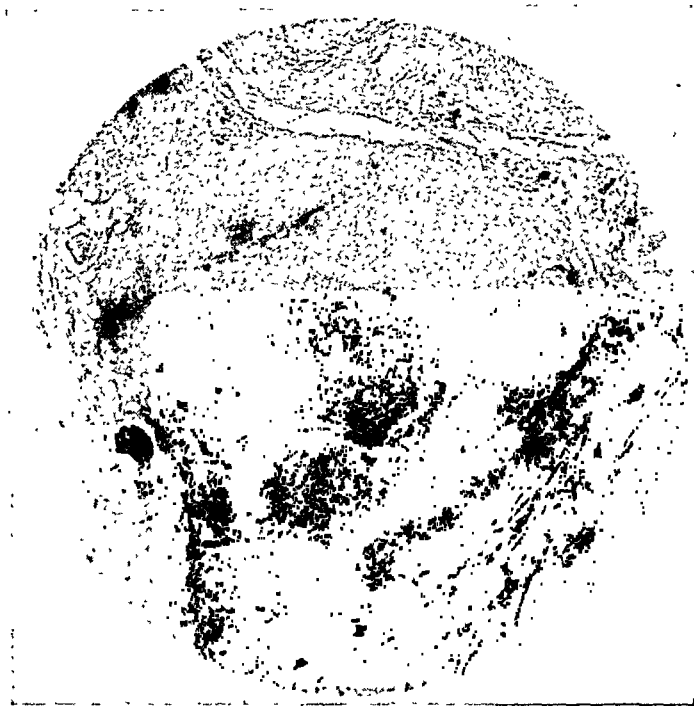


Fig. 4.—Thrombosed vein in the broad ligament. The lumen is filled by a thrombus comprised largely of polymorphonuclear leucocytes. Exudate has also extended into the intimal coat.

possible. However, manipulation necessary to find the limits of the thrombosis is not without danger, for nature has almost always established a more or less complete protective cellular reaction to extension of the infection. This was shown in 31 cases autopsied by Seegert: in 26 he found pure thrombophlebitis with complete obliteration of the vessel lumen, and in 5 thrombophlebitis with marked periphlebitis involving the associated lymphatics, which illustrates that in even those cases which end fatally the local focus is surrounded by cellular defense.

Operation at the time of complete occlusion is unnecessary, for nature has accomplished what we expected to do by ligation without

the manipulation and shock. Mortality figures in the cases in which surgical intervention has been employed are always unreliable, for no man can tell the case which will recover without surgery. Operation to be successful must be done when the patient is a fair risk and surgery may, and, in our opinion, often does turn the tide against us.

In 182 cases selected from the literature which were subjected to transperitoneal ligation (Table I) there were 94 deaths, or a gross mortality of 51.6 per cent. In the corrected list we find 111 cases which are considered as favorable surgical risks with 34 deaths, or 33.9 per cent mortality. Huggins' corrected mortality figures which are not included in this table, are 33.3 per cent. Contrast these results with those reported by B. C. Hirst: 37 cases conservatively treated,

TABLE I. SUMMARY OF TRANSPERITONEAL OPERATIONS

	TOTAL	DEATHS	GROSS MORTALITY	FAVORABLE CASES	DEATHS	CORRECTED MORTALITY
1 spermatic vein excised	35	17	51.1	20	4	20.0
1 spermatic vein ligated	35	15	44.1	26	7	26.8
Ligation or excision of both	20	8	40.0	16	4	25.0
Ligation or excision of 1 sperm. and 1 hypogastric vein	15	6	55.5	10	1	10.0
Ligation and excision of both spermatic and 1 hypogastric	9	5	29.0	6	2	33.3
Ligation and excision of both spermatic and hypogastric	17	5	92.3	12	1	8.3
Ligation and excision of 1 hypogastric	14	12	71.4	10	8	80.0
Ligation and excision of 1 spermatic and common iliac	14	11	83.3	11	7	66.6
Ligation of Vena Cava	6	5	76.9			
No details	17	10	16.9			
Average	182	94	51.6	111	34	33.9

with 5 deaths, or a mortality of 13.5 per cent and the 63 cases from our own clinic with 19 deaths, and I feel that our conclusions are justified.

Our experience, which is drawn from observations and autopsy and laboratory studies, together with years of conservative support leads us to the following conclusions: (1) that thrombophlebitis is a conservative process which follows upon an endometrial infection not confined to the uterine cavity, owing to the poor contraction and retraction of the uterus, (2) that there is always cellular reaction in and about the vein, (3) that the clinical syndrome is clean-cut but the physical signs are lacking or misleading, owing to the fact that there is always some periphlebitis present, (4) that any manipulation, bi-

manual examination or operation breaks down nature's protective barrier, (5) that the indications or the time to institute surgery are not definitely established, (6) that the septic woman is admitted by all to be a bad surgical risk, and (7) finally, that the mortality from operation, even in the best clinics does not warrant subjecting the woman to surgery.

20 LIVINGSTON STREET.

COMPLETE LACERATIONS OF THE PERINEUM AND THEIR SURGICAL TREATMENT*

By LOUIS E. PHANEUF, M.D., F.A.C.S., BOSTON, MASS.

(Professor of Gynecology, Tufts College Medical School, Chief of Service, Department of Gynecology and Obstetrics, Carney Hospital)

AN EXAMINATION of my personal records dating from June, 1917, to June, 1928, shows that during this period of eleven years, I had operated upon 42 patients for complete or third degree lacerations of the perineum. Five of these patients were operated upon shortly after labor. Another, a child seven years old, had a complete repair of the perineum for a traumatic laceration involving the perineal body, the sphincter ani muscle and the anterior rectal wall. She was operated upon shortly after admission to the hospital. The others had secondary repairs.

PROPHYLAXIS

Much has been written, during the last decade, on the prevention of complete lacerations of the perineum. As a matter of fact, this complication of childbirth may be avoided, in most instances, by giving proper attention to the perineum during delivery. There are two types of prophylactic measures recommended in order to avoid this accident, first, incisions of the perineum, and second, manual dilatation of the perineum and vagina.

Two types of incisions are in use: the median, which is referred to as a perineotomy and the lateral which is known as an episiotomy. The advocates of the episiotomy object to the perineotomy on the grounds that if the incision is extended by the advancing head it may go through the sphincter ani muscle. This, however, is not a sound reason and may be avoided by operatively extending the incision in such a way that it encircles the anus on one side, thus saving the sphincter. As a general principle, it is probably better to employ a lateral incision when considerable room is required, and a median when the opposite obtains. The lateral episiotomy is done on the side toward

*Read before the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

which the occiput points, in other words, a right episiotomy in a right position and a left episiotomy in a left position. Very rarely is it necessary to make an incision on the two sides.

Incisions of the perineum are generally performed on primiparae, although they are sometimes necessary on multiparae. A multipara who has had an episiotomy or an extensive repair of the perineum with her first labor, comes to a second with external genitals resembling those of a primipara, and in addition having a scar where the union of the severed tissues took place; it may, therefore, become necessary to again incise the perineum at this delivery. The same applies to the multipara who has had a secondary repair of the perineum for a serious laceration.

PERINEAL INCISIONS VS. DILATATION OF THE PERINEUM

Those who favor manual dilatation of the perineum and vagina before delivery state that this procedure obviates the performance of perineal incisions. While this method will overcome a resistant perineum, it not infrequently results in the separation of the levator ani muscles under the intact mucous membrane and skin. As a result of this a rectocele will soon appear. This condition practically never occurs after well sutured perineal incisions.

The absence of any large rectocele in the 42 cases operated upon for complete laceration of the perineum tends to show that it is not the tearing of the perineum which is responsible for this lesion, but rather the stretching and the relaxation of the fascial structures of the posterior vaginal segment.

IMMEDIATE VS. LATE REPAIR

It has been my custom to repair this type of laceration immediately after the expulsion of the placenta when I see the patient after delivery. Five such cases were treated and all of them obtained excellent results. Their puerperia were not prolonged nor complicated as a result of this repair. On the other hand, if the parturient is not seen soon after delivery, at least three months are allowed to elapse before operating. At this time involution has taken place, the edema has disappeared, scar tissue has formed between the torn edges and better operative results are obtained than when the operation is attempted a few days after labor.

TECHNIC OF OPERATION

The pelvic floor is opened by an II-shaped incision. The lateral incision, on each side, extends from a point below the duct of the vulvovaginal gland to the retracted end of the sphincter. The transverse incision joins the two lateral by running through the edge of the scar

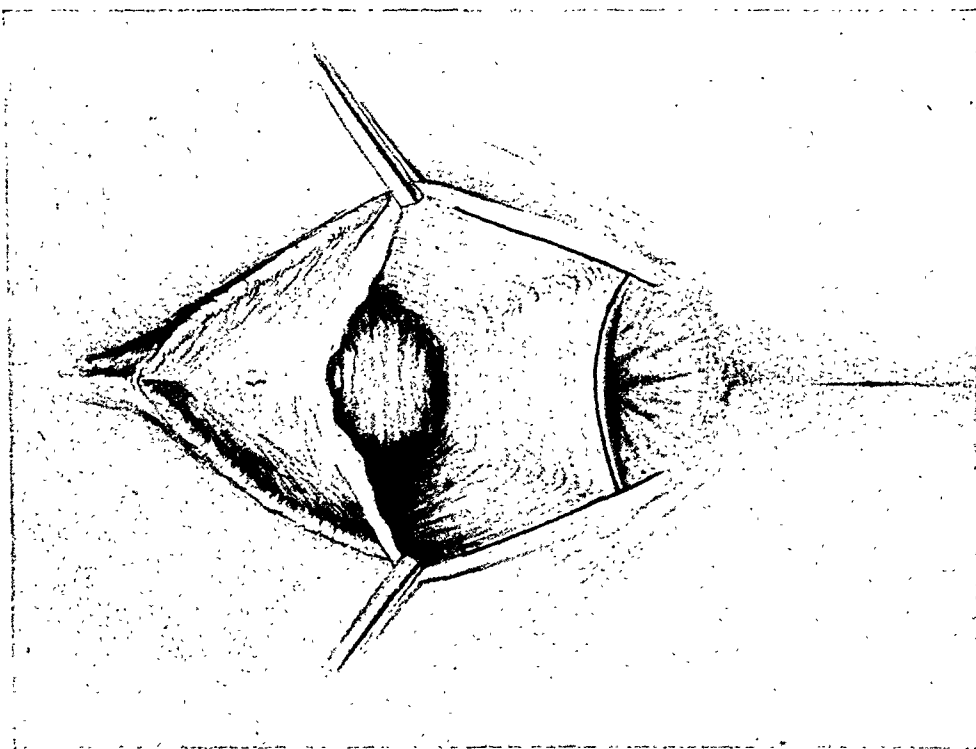


Fig. 2.—Opening the pelvic floor. The incision is H-shaped. The lateral incision, on each side, extends from a point below the duct of the vulvovaginal gland to the retracted end of the sphincter. The transverse incision joins the two lateral by running through the scar tissue uniting the rectal and vaginal walls.

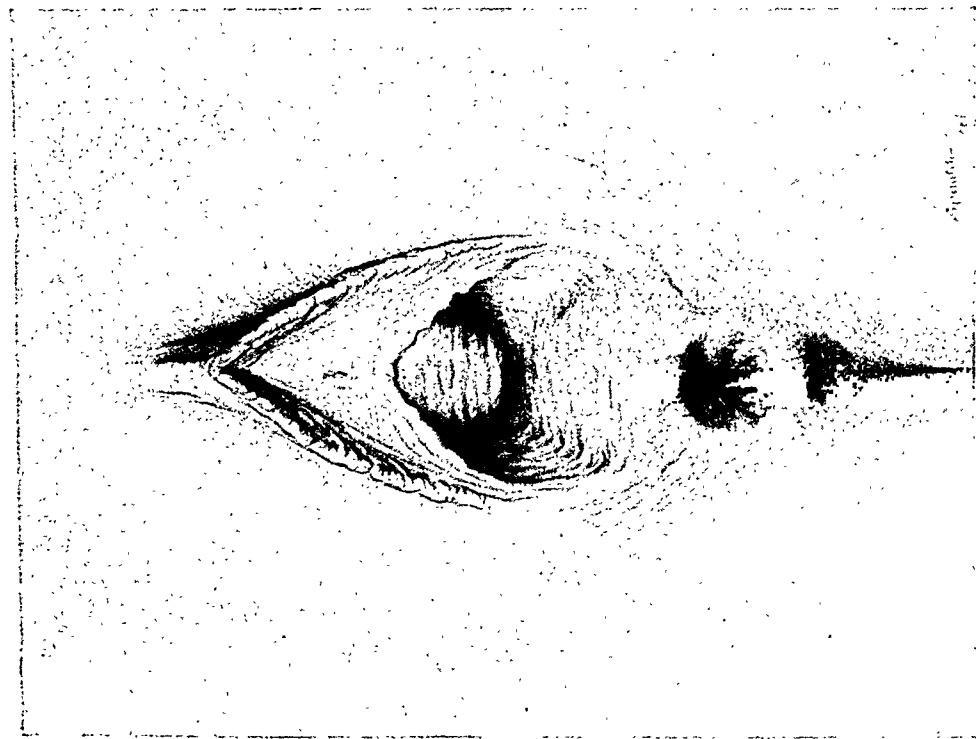


Fig. 1.—Complete laceration of the perineum involving the sphincter and muscle and the anterior rectal wall.

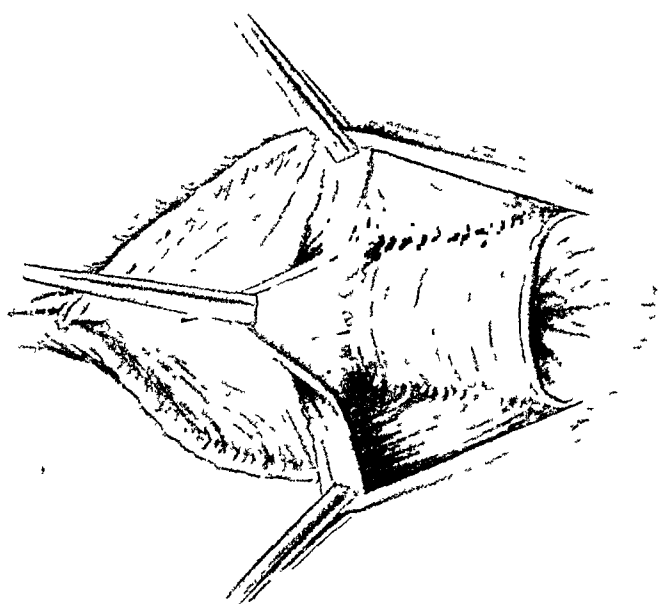


Fig. 1.—The denudation is completed and the individual structures are exposed.

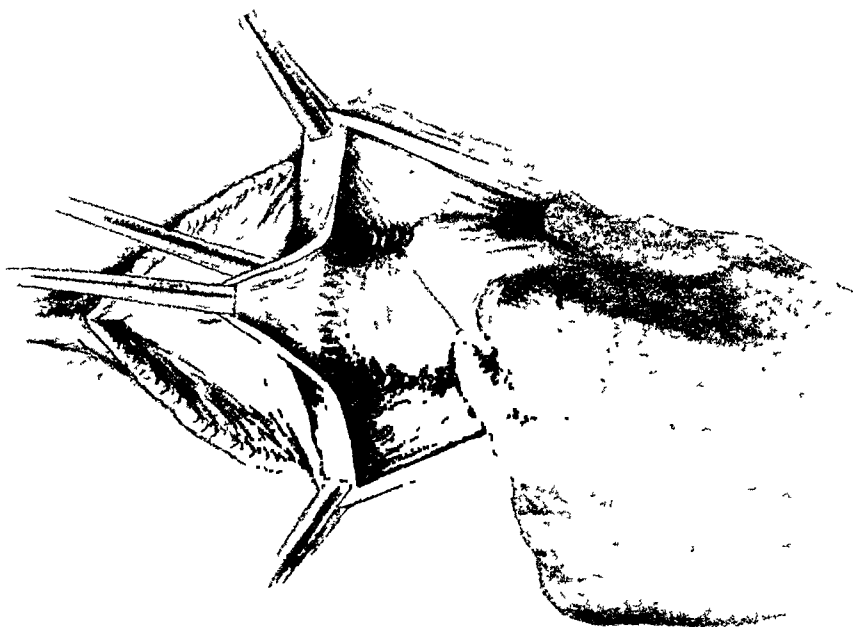


Fig. 3.—The vaginal flap has been raised. The rectum is separated from the levator ani muscles, by blunt dissection.

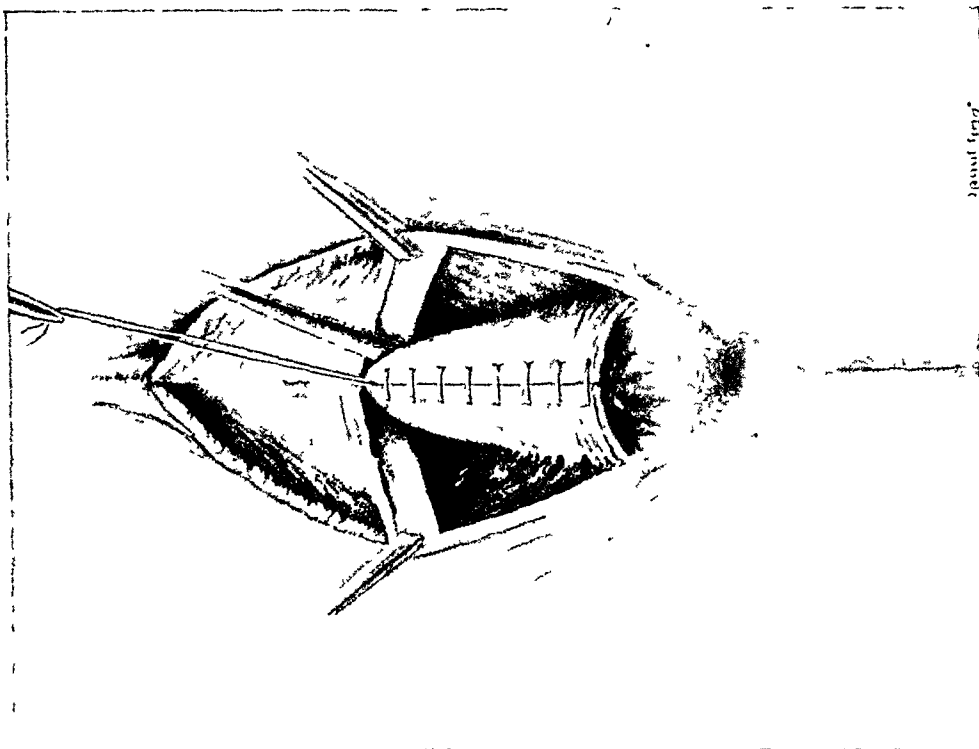


Fig. 6.—The first layer of rectal sutures is completed.

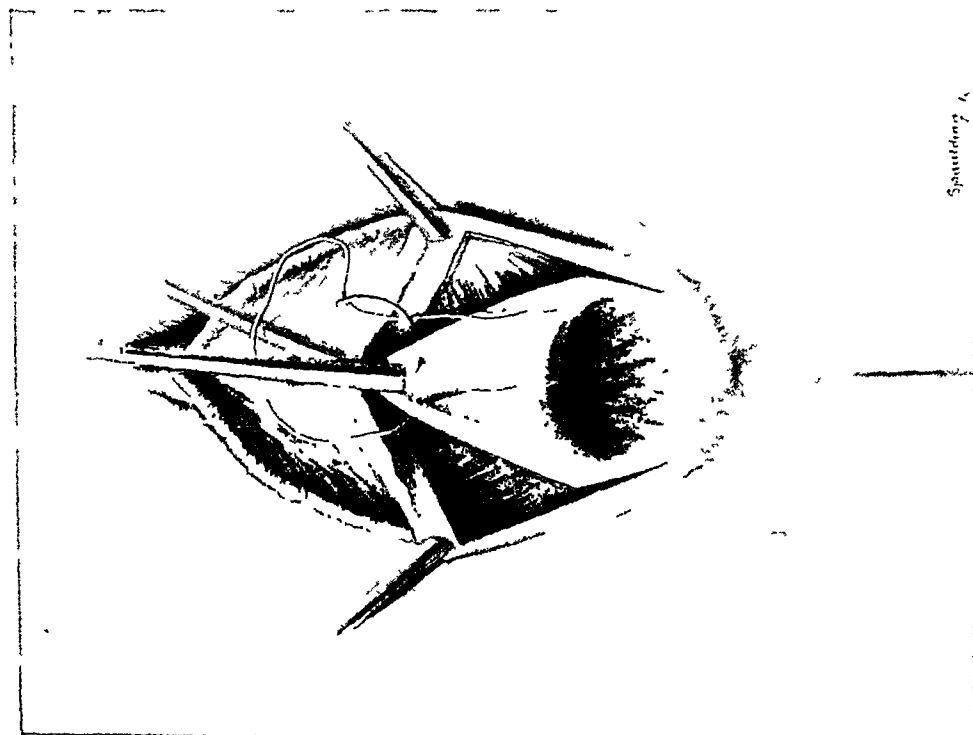
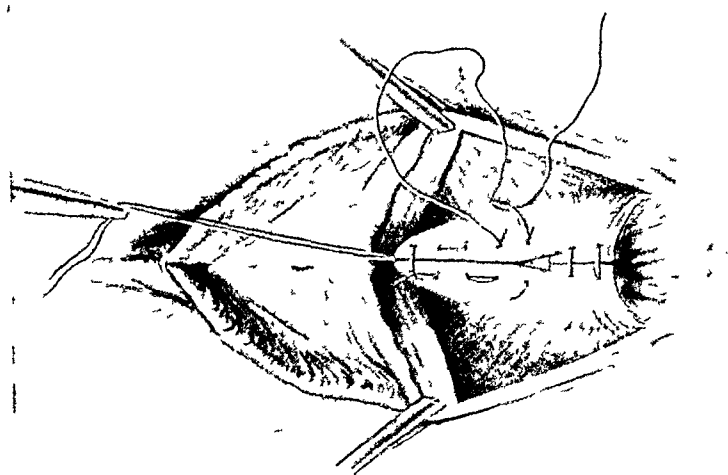
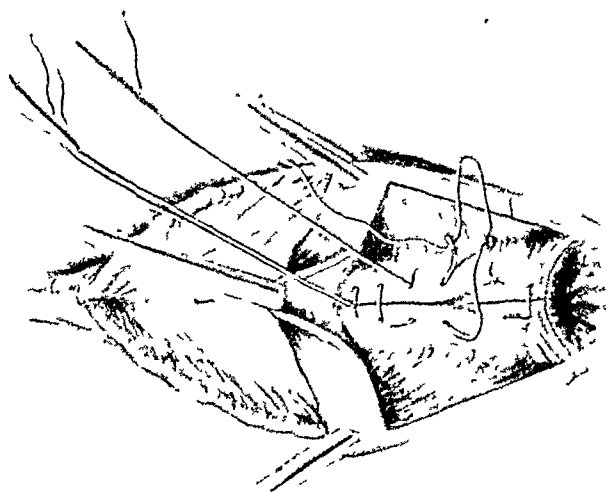


Fig. 5.—The anterior rectal wall is picked up by an Allis forceps and put on stretch. The anterior rectal wall is united by interrupted sutures of linen thread, the knots being tied within the bowel lumen.



Spinal Anesth.

Fig. 7.—The perineal tissues are approximated over the first suture line by a continuous mattress suture of No. 0 chromic catgut.



Spinal Anesth.

Fig. 8.—The perineal tissues are further approximated by figure of eight sutures of No. 0 chromic catgut. The rectal wound is thus closed in three layers.

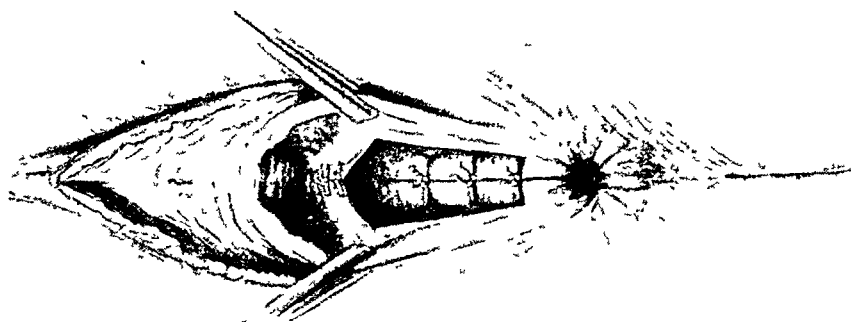


Fig. 10.—The excess of the vaginal flap has been resected. The vaginal wall has been approximated with interrupted sutures of No. 2 chromic catgut. The levator ani muscles covered by their fascia are united by three interrupted sutures of No. 2 chromic catgut.

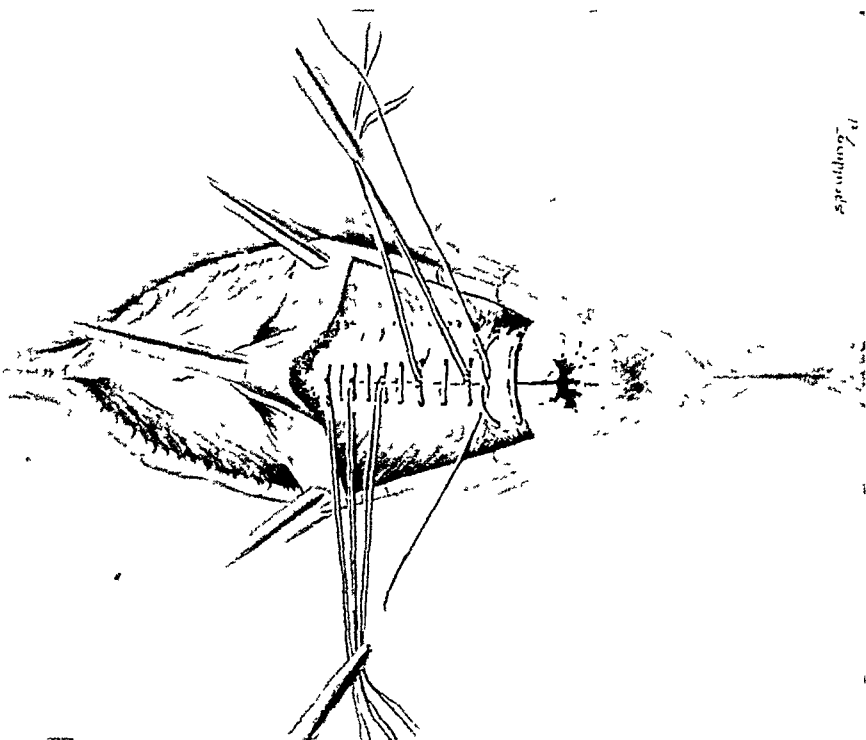


Fig. 9.—The rectal suture is completed. A figure of eight suture of No. 1 chromic catgut approximates the torn ends of the sphincter ani muscle.

tissue uniting the rectal and vaginal walls. A flap of posterior vaginal wall is raised exposing the rectum which is separated from the levator ani muscles by blunt dissection. The anterior rectal wall is picked up by an Allis forceps and put on stretch; the torn edges are united by interrupted sutures of linen thread, the knots being tied within the bowel lumen. The perirectal tissues are approximated over the first suture line by a continuous mattress suture of No. 0 chromic catgut. The perirectal tissues are further approximated by figure of eight

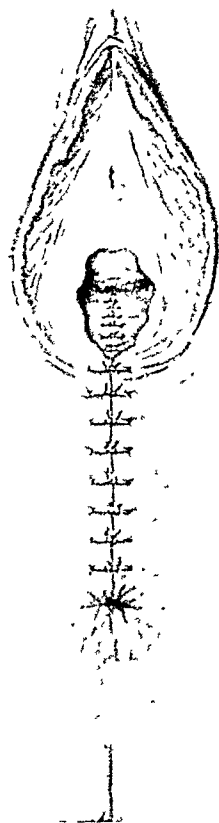


Fig. 11.—The external perineum has been closed with interrupted sutures of No. 2 chromic catgut. These sutures, in their course, pick up the united levator ani muscles to obliterate dead space. A subcuticular stitch may be substituted for the interrupted sutures. The final result of the operation is shown.

sutures of the same material. The rectal wound is thus closed in three layers. The torn ends of the sphincter ani muscle are dissected out of their bed of scar tissue and approximated with a figure of eight suture of No. 1 chromic catgut. The excess of the vaginal flap is resected, the edges of the vaginal incision are united with interrupted sutures of No. 2 chromic catgut, and the levator ani muscles, covered by their fascia, are brought together by three interrupted sutures of the same catgut. The external perineum is closed by interrupted sutures of

No. 2 chromic catgut which in their course pick up the united levator ani muscles to obliterate dead space. A subcuticular stitch may be substituted for the interrupted sutures.

AFTER CARE

We have followed a definite routine, which has proved satisfactory, on the Gynecological Service of the Carney Hospital. For the first five days the diet consists of the white of an egg, an ounce of strained orange juice and enough water to fill a glass. This is given every three hours during the day and at the same intervals at night if the patient is awake. Between these hours she is given as much water as she cares to take. On the sixth day a cup of beef tea or strained broth is substituted for the albumen mixture. The morning of the seventh day the patient is given an ounce of castor oil by mouth, six hours later six ounces of warm sweet oil is gently instilled in the rectum, she is given a low soap suds enema when the desire to empty the bowel becomes apparent, and she is instructed not to strain. After this a soft diet is allowed and by the ninth day she is on a full diet.

A vaginal douche consisting of one quart of Dakin's solution is given, through a soft rubber catheter, morning and night after forty-eight hours.

Catheterization of the bladder is resorted to every twelve hours if the patient does not void readily.

SUMMARY OF CASES

	<i>Cases</i>
Fresh complete laceration of the perineum	6
Old complete laceration of the perineum	18
Complete laceration of the perineum with involvement of anterior rectal wall	13
Complete laceration of the perineum with involvement of anterior and posterior rectal walls	1
Complete laceration of the perineum and rectovaginal fistula	4
Total	42

OPERATIONS PERFORMED IN ADDITION TO THE REPAIR OF A COMPLETE LACERATION OF THE PERINEUM

	<i>Cases</i>
Dilatation and curettage	6
Trachelorrhaphy	7
Amputation of cervix	6
Anterior colporrhaphy	8
Interposition operation	4
Vaginal panhysterectomy	1
Incision of fistula-in-ano	1

In three cases of complete repair of the perineum, a small rectovaginal fistula developed because of infection. These three fistulas were closed at a second operation.

The lacerations were the result of childbirth in forty cases. In the case of one child, seven years old, it was traumatic, and the laceration was due to falling on a picket fence. In another child, also seven years old, it was due to rape.

END-RESULTS

The final result was satisfactory in all these patients, three of whom had to be operated upon twice because of small rectovaginal fistulas which had developed from improper healing due to a low grade infection in the wound. All obtained excellent sphincter control and satisfactory perineal bodies. Five of the women were subsequently delivered of living children by the low cervical cesarean section.

270 COMMONWEALTH AVENUE.

UTEROTUBAL INSUFFLATION FOLLOWED BY PREGNANCY IN 205 CASES OUT OF A SERIES OF 2000 CASES OF INFERTILITY*

AN ANALYSIS OF THE FACTORS INVOLVED WITH SPECIAL REFERENCE
TO THE THERAPEUTIC APPLICATION OF THE METHOD

BY I. C. RUBIN, M.D., F.A.C.S., NEW YORK, N. Y.

(Associate Gynecologist, Mt. Sinai Hospital)

THE method of peruterine tubal insufflation (transuterine tubal inflation) was originally devised for the specific purpose of determining tubal patency or nonpatency thus eliminating the necessity of an exploratory laparotomy. The diagnostic method has met with gratifying approval from all parts of the world.

At this time I feel it a sacred and pleasant duty to express to the many interested investigators my deep gratitude for their aid in the steady development of this method. Without these efforts the method could not have attained its present usefulness.

Although my interest was primarily in the diagnostic possibilities of this nonoperative procedure, it was early realized that the method might also prove to be therapeutic.

Peterson and Cron,¹ and Rongy,² were among the first to stress the therapeutic aspect. Special notes and reports on the therapeutic effect of tubal insufflation were made by Aldridge,³ P. N. Charbonnet,⁴ E. Douay,⁵ Francillon,⁶ H. Fuchs,⁷ G. Frommolt,⁸ F. Geppert,⁹ E. Graff,¹⁰ A. Hamant,¹¹ Hirst and Mazer,¹² G. Kaboth,¹³ M. Lobe and J. Dalsace,¹⁴ S. R. Meaker,¹⁵ C. F. Morkane,¹⁶ E. Pribram,¹⁷ P. Romeo,¹⁸ M. Samuel,¹⁹ Marie von Scheller,²⁰ G. Schwarzwaller,²¹ H. Sellheim,²² P. Titus,²³ and others. I was able to report upon 101 cases of pregnancy in a paper read before the obstetric section of the Royal Academy of Medicine in London, October, 1925.²⁴ In that report no detailed attempt was made to analyze the factors involved in tubal insufflation which accounted for the successful results obtained. Since

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., Sept. 10-12, 1928.

1925 I have observed a little more than an equal number of cases of pregnancy following insufflation. It may now be timely in the light of this additional experience to evaluate the rôle of peruterine tubal insufflation in the treatment of sterility.

Dickinson and Cary,²⁵ writing on *Sterility, Analysis of Cures and Failures* state: "The distention of closed tubes by gas, air or fluid presents as yet no comparative series of sufficient numbers to gauge results." It is hoped that the present analysis of the factors involved in 205 cases of pregnancy following the use of uterotubal insufflation will be a beginning in this direction and that other reports will soon follow to add, to modify or to corroborate the findings presented at this time.

Here it may at once be acknowledged that sterility comprises a number of other factors besides obstructed tubes, and that due and adequate attention must be given to pathologic conditions in the male as well as the female which interfere with the reproductive function, whether the disturbance be primary in the genital organs or secondary to some remote organic or general constitutional abnormality. It is perhaps necessary to mention this point because through overzealous enthusiasm for one special procedure, other important elements in the consideration of a sterile marriage are sometimes apt to be disregarded or not sufficiently stressed.

The term sterility may now be somewhat reinterpreted in the light of what has been accomplished in diagnosis and therapy. Reynolds has emphasized the term infertility. This implies the possibility of a temporary lowering of fertility which is amenable to treatment and removes the stigma of absolute hopelessness in the prospect of bearing offspring. What was regarded and still is perhaps by many as an absolute cause of sterility, as for example tubal occlusion or tubal ablation, may sometimes be remedied by surgical intervention. Giles²⁶ writing in 1919 on *Sterility* considers "tubal disease one of the quite definite and incurable causes of secondary sterility as it is of primary sterility."

In recent years salpingostomoplasty, tubal reimplantation into the uterus as practiced and reported by Cullen,²⁷ Cotte et Bertrand,²⁸ Riess,²⁹ Shaw,³⁰ and Unterberger,³¹ and ovarian transplantation into the uterus as first done by Estes,³² Franck,³³ Mayer,³⁴ Morris,³⁵ Palmer Dudley,³⁶ Tuffier et LeTulle,³⁷ have occasionally resulted in eventual conception taking place. Though success has not frequently followed these comparatively newer procedures, accumulating reports of successful cases cannot fail to encourage workers in this field of medicine, not to speak of the anxious childless women who are heartened by any favorable case that may come to their attention. In the same way may be regarded that large group of cases of childlessness where one conception or more has resulted either in an early miscarriage or in still-

birth, or even a normal full-term only child that may have died shortly after birth or some time before puberty. These women having once enjoyed the experience of parenthood are all the more eager for a child to satisfy the maternal instinct.

I

STATISTICAL ANALYSIS OF 205 PREGNANCIES OUT OF 2000 CASES OF INFERTILITY PRIMARY AND SECONDARY STERILITIES

The present series of 205 cases of pregnancy are taken from 2000 consecutive cases of sterility in my private practice.

The actual total number of pregnancies occurring out of 2000 cases of sterility is not known because no systematic questionnaire has ever been sent out to these patients. The data were obtained by voluntary information received from the patients or friends referred by them for treatment of sterility.

There were 1070 primary sterilities and 930 were secondary sterilities. Of the 205 who became pregnant 132 cases were primary, and 73 cases were secondary sterility. Thus although the proportion of primary to secondary sterility is as 10:9, the proportion of pregnancies occurring in both types of sterility is practically as 10:5. In my first series of 101 pregnancies there were 63 cases of primary sterility and 38 of secondary sterility, almost the same proportion obtaining as for the 205 cases. If this ratio is supported by a larger series, it will indicate that the woman who has failed ever to conceive (involuntary primary sterility) has twice the better chance of becoming pregnant as a result of treatment than the woman who has become sterile following one or more abortions whether spontaneous or induced.

There are many questions involved in this analysis. Some of them indeed may be of the greatest importance. An exhaustive analysis would require more time and labor than I have been able to devote at present. It is hoped this will be done. I feel that only a beginning has been made. For example it would be interesting to know the complete status of the genital organs of the female and of her general constitutional condition; to know the potency of the male, etc. I shall not go into the numerous causes of sterility, though this is always tempting in a discussion of therapy, but shall limit myself to the part played by tubal insufflation. In this paper only a few of the historic data bearing on etiology will be included.

THE EVENTUALITY OF PREGNANCY IN THE 205 CASES

The data with regard to pregnancy following tubal insufflation available in the 205 cases show that 188 had full-term children, and 17 had early miscarriages (8.3 per cent of the 205 cases pregnant).

Peterson and Cron¹ reported 3 abortions at the third month and 10

full-term pregnancies out of 13 women who reported themselves pregnant following transuterine inflation.

These figures are interesting because the question always arises as to the possibility of the greater predisposition on the part of these women to abort or to have pathologic offspring.

Of the 68 cases which I have personally attended following per-uterine tubal insufflation there were in all 77 children born. Forty-five were boys, 3 of whom were of a second pregnancy, and 32 girls, of whom 9 were of the second pregnancy. The larger number of boys is explained by the fact that the pregnancies resulting from x-ray stimulation are included in this series and as has been pointed out in 1926,⁴¹ the boys outnumber the girls in the ratio of practically 6 to 1, at least as far as a small series of x-ray stimulation cases is concerned.

Three women of the 68 cases aborted; 1 at four months, 1 at three months and the third 3 times (at four, five and five months). These patients suffered from delayed periods. From my own study of these particular cases associated with habitually delayed periods they appear to exhibit a greater tendency to abort than women whose menstrual function is normal.

This relatively high incidence of abortions in the group of cases not receiving personal attention, i.e., 14 out of 137, was due in all likelihood to two factors: (1) they belonged to the oligomenorrhea group of sterile patients and were not aware of being pregnant until bleeding began; (2) they did not take the extraordinary care during the early weeks and months of pregnancy which is so essential in the treatment of infertility. Attention to this point as is well known determines either early interruption or pregnancy carried to near term or to full term.

If we abstract from the pregnancies those resulting from x-ray treatment, the proportion of girls would be slightly greater than boys or about the same.

EXTRAUTERINE PREGNANCY

In 3 cases under my own observation out of the total series of 2000 cases of infertility an extrauterine pregnancy followed some time after tubal insufflation, i.e., once in 666 cases.

Conditions demanding operative procedures are apt to be followed by pelvic adhesions particularly about the tubes and ovaries which may interfere with conception. Appendicitis occurring in youth obviously has a graver import for the future in the case of girls than boys. (A larger series will be reported bearing on this point.)

THE TIME FACTOR IN STERILITY

In any consideration of treatment of sterility it is important to take account of the question as to how long after marriage shall we wait before encouraging a married couple to seek medical relief.

From three to four or five years has previously been regarded as ample time to judge a sterile marriage. This figure is obviously arbitrary, for some women have become pregnant long after this interval.

Several of the cases seeking advice for their failure to conceive were married a relatively short time. One young woman was ardently desirous of an offspring for personal reasons the chief of which concerned the question of an estate. Another had witnessed the difficulty encountered by two older sisters who became pregnant from three to five years after marriage. Another patient was well over thirty-five years of age and felt she had but a short time for childbirths left to her. She sought advice within a few months after marriage. Several had been married to a first husband for a number of years without issue or having had an only child dead or alive. They did not wait long after consummating a second marriage to find out why it did not prove fertile. Thus there are various circumstances: social, economic, domestic and some of private personal nature that impelled these patients to seek a solution out of their difficulty to conceive.

II

The present analysis was further undertaken to determine (1) whether or not tubal insufflation has a therapeutic value and (2) what are the circumstances or evidences demonstrating this fact. The evidence necessary to prove a therapeutic efficacy of the method as adduced from my case histories is based on several fundamental factors.

1. The age of the woman must be thirty years or over.
2. Pregnancy must follow within a month or at most two months after tubal insufflation.
3. The length of marriage must be three years or longer.
4. The case must not be treated by any other measure than by tubal insufflation.
5. The insufflation must be done within the first two weeks of a last regular period or in the preovulation phase.
6. Repeated insufflation accompanied by a relatively lower pressure and hence normal patency on a second, third or fourth test and followed by pregnancy may be assumed to be helpful.
7. A high initial pressure during insufflation indicating as it does some abnormality in patency is followed by pregnancy. Under such circumstances pregnancy may be assumed to be a sequel of the test.
8. Patients must not have taken precautions for at least one year prior to insufflation.

The ages of the patients becoming pregnant are of particular interest in connection with the question of the therapeutic effect of insufflation. They are divided in five groups.

There were 66 who were between twenty and twenty-five years old;

83 were between twenty-five and thirty; 49 were between thirty and thirty-five; 4 were between thirty-five and forty, and 1 was over forty years old. Two histories did not give the precise age.

In other words 54 women were thirty or over, i.e., about 27 per cent of the women who became pregnant were thirty or over, so that one should not be inclined to discourage a married couple from seeking cause for their failure in conception. They deserve every consideration, and if therapy consists only in proper instruction as to sex hygiene and general regimen, happier results may be thus achieved than by putting them off until they have been married several years.

In any analysis of end-results of a therapeutic procedure in sterility it is necessary to know what is the expectancy of conception among married couples after an undisturbed length of time.

The Publication by G. Kaboth and J. Kleefisch⁴³ on the conception probability in childless marriages has an important bearing on this matter. They have shown that out of 5,331 cases whose marital history they investigated, the conceptional chances of the women reckoned in successive six-month periods after marriage for spontaneous conception was found to be as follows:

After 2 years' sterility	9.9 %	became pregnant.
2½	8.14%	
3	10.5 %	
3½	6.3 %	
4	3.4 %	
4½	6.0 %	
5	6.3 %	
5½	4.9 %	
6	4.9 %	
6½	3.4 %	
7	Practically none (3 conceptions out of 922 pregnancies)	

Of the 73 relative sterilities in my series 38 had failed to become pregnant for three years following the last full-term pregnancy or abortion; 17 for five years; 11 for seven years; 5 between seven and ten years and 2 for longer than ten years (1 for twelve years; and 1 for fourteen years). Of the 132 primary sterilities, 72 were married for three years; 34 from three to five years; 15 from five to seven years; 6 from seven to ten years; and 3 for longer than ten years (2 for twelve years; 1 for fourteen years). In two histories the length of marriage was not stated.

The time elapsing between the last menstrual period and the performance of tubal insufflation is also of particular interest in connection with its therapeutic application. In 15 cases this was done within the first three days after the last menstrual period; in 149 cases it was done between the fourth and fourteenth day following the cessation of the last period; in 22 cases during the third week of the menstrual cycle; in 14 cases the last menstrual period was given as

twenty-two days to one year. These 36 cases were associated with varying degrees of delayed menstruation. There were 15 cases in which no data were recorded with reference to the definite time after menstruation in which the test was performed. In normally menstruating patients the time of choice was within one week from the last menstrual period and next in preference the second week after menstruation.

The time elapsing between the performance of tubal insufflation and conception according to months was as follows:

59 pregnancies occurred within 1 month after insufflation.						
39	"	"	"	2 months	"	"
15	"	"	"	3	"	"
18	"	"	"	4	"	"
8	"	"	"	5	"	"
13	"	"	"	6	"	"

152

Thus there was a total of 152 out of 205, or 75 per cent who became pregnant during the first six months after performing the test.

Twenty-eight became pregnant during the second six month period after the insufflation; 12 became pregnant within the second year period following insufflation; 5 within the third year; 2 within the fourth year, and 1 within four and three-fourths years after the tubal insufflation.

In 5 cases the data regarding the time elapsing between the tubal insufflation and the pregnancy is not definitely recorded.

Sterile patients are more apt to report a pregnancy following a short period after peruterine insufflation than later because they themselves regard the procedure as therapeutic.

Of the greatest significance from the therapeutic side is the fact that 59 or a little more than 28.6 per cent of these women become pregnant within a month and 39 within the second month following the tubal insufflation; making 98 cases in all who became pregnant within two months, or nearly 50 per cent.

I have elsewhere²⁴ called attention to the importance of this short interval following tubal insufflation as a criterion of the therapeutic value of the method. If in addition such pregnancy takes place after an infertile marriage of five or more years, we possess a more definite proof of the therapeutic value of insufflation.

If we divide a series of 59 cases in which the tubes were insufflated according to weeks after the last regular menstrual period it will be seen that 24 patients became pregnant within the first month after insufflation when the latter was done the first seven days after the last menstrual period. Twenty-five became pregnant within a month after insufflation carried out the second week after the last menstrual

period. Five became pregnant within a month when the insufflation was performed during the third week following the last menstrual period. In one case pregnancy followed within a month after an insufflation done one month after the last menstrual period. In 3 of the 59 cases the exact date of the test with respect to the last menses is not stated. As the test was preferably not carried out after the second week after menstruation the six women becoming pregnant after an insufflation done later than the first two weeks of the menstrual phase were patients whose periods were habitually delayed. The test was also carried out on days later than the second week after menstruation in a few instances because the patients came from out of town and could not wait for the more preferable time.

The most significant point about these figures is that although pregnancy can follow insufflation when done at any time after a regular menstrual period the preponderance of pregnancies occurred after insufflation performed within the first two weeks after the period.

Summary.—Forty-nine out of the 59 cases becoming pregnant within a month after the insufflation were treated or examined by this method within two weeks after the period; 23 during the first week and 26 during the second week. In other words 87 per cent of the pregnancies followed insufflation when performed within two weeks while 13 per cent followed insufflation done later than two weeks after insufflation.

Although the therapeutic value of tubal insufflation is best judged by its immediate success as witnessed in the above 59 cases, it was interesting to compare the data in the 39 pregnancies which followed within two months after the insufflation. Of these 39 cases, 20 became pregnant who were examined by the method of insufflation within a week after the cessation of the last regular period; 14 cases within two weeks after the cessation of the last regular period; 2 cases the third week; 1 case twenty-six days; and 1 case six weeks after the last regular menstrual period. In one case the date of the last menstrual period was not definite. Here again it will be seen that the vast majority of pregnancies favored the insufflation done within the first two weeks postmenstruum (83 per cent).

Obviously the test cannot exercise any definite therapeutic value when more than two regular menstrual periods supervene. Here it simply has a diagnostic and prognostic value. The fact that eight women became pregnant after an interval of more than two years following the use of peruterine insufflation should cause us to pause in our prognosis before we give a hopeless outlook for childbearing when the fallopian tubes have been found to be patent. Doubtless there were other factors besides tubal that conspired to prevent these eight women from conceiving more promptly.

Summary of the 205 cases with respect to the tubal insufflation and the day following the last menstrual period.

84	were	done	during	the	first	week	postmenstruum.
70	"	"	"	"	second	"	"
22	"	"	"	"	third	"	"
6	"	"	"	"	fourth	"	"
7	"	"	"	"	6 weeks to 7 months after		
					the last regular period.		
					1 was done a year after the last regular period.		

In 15 cases the data regarding the last regular period are not given.

In 42 per cent of the 205 cases becoming pregnant the tubal insufflation was done within one week after the last period while in 75 per cent the insufflation was done within the first half of the menstrual interval.

Since the greater number of insufflations were done by preference in the first half of the menstrual interval than in the second half, it may well be argued that this fact in itself may account for the consequently greater incidence of pregnancy. But the results obtained for the one month and two month periods would still point to the postmenstrual phase as the best time for tubal insufflation to be done and as offering the best chance for impregnation. Other theoretic reasons for this preference were given in a special communication in the *Journal of American Medical Association*.⁴⁴

The duration of marriage was recorded in 58 of the 59 patients who became pregnant one month after the test. In one case the exact duration of marriage was not recorded.

Twenty-two were married between one and three years; 17 were married for three to five years; 19 were married for five years or longer, of which 13 were married longer than five years.

Duration of marriage of patients who became pregnant two months after test is here summarized.

Nineteen were married between one and three years; 13 were married between three and five years; 7 were married longer than five years.

In other words 30 patients who were married three to five years at the time of treatment became pregnant within one or two months following tubal insufflation, and 26 patients who were married five years or over became pregnant within the first two months following the tubal insufflation. These figures give the impression more of post hoc ergo propter hoc than as favoring coincidence.

PERUTERINE TUBAL INSUFFLATION REPEATED AS A THERAPEUTIC MEASURE

A high initial pressure necessary to allow the gas to pass through the tubes and followed by pregnancy after insufflation may be assumed to point to its therapeutic value. In Douay's⁵ series of 100 cases 18 became patent after repeated insufflation and 5 of these or 28 per cent became pregnant. Graff¹⁰ found 44 per cent of his patients to have nonpatent or partially patent tubes. Twelve per cent of his cases became patent after repeated tests and of these (14 out of 43 cases) 32.6 per cent became pregnant.

Inasmuch as I am here dealing with the therapeutic side of peruterine tubal insufflation, the matter of its diagnostic value will not be entered into. A recent paper comparing it to intrauterine lipiodol injection deals with this phase.⁴⁵ It may be stated briefly that E. Graff found the results of the tube examination with peruterine insufflation to be corroborated in all of the 19 cases which were subjected to subsequent laparotomy.

A. Mandelstam⁴⁶ confirmed the findings by insufflation in 100 cases that came to operation. Mandelstam basing his conclusion upon 1500 pertubations states that "tubal insufflation is a safe and valuable procedure the use of which is not only desirable but indispensable in the treatment of sterility because it must be clear that without establishing the cause of the infertility no well founded therapeutic measure can and should be used." In 500 cases with positive results, that is where patency was demonstrated, Mandelstam was able to follow up results in 98 cases. Of these 98 cases 61 became pregnant; 4 the same month; 5 after two months; 3 after three months and the rest after four months to two and one-half years. In two cases with a negative pertubation result, pregnancy ensued.

Pertubation is considered by Mandelstam to be superior to salpingography although "in negative cases it gives no clue as to the site of obstruction." In cases of permeable tubes he does not use salpingography at all as a matter of principle and only employs the latter to diagnosticate the site of obstruction. Out of 34 cases of salpingography he met with 3 cases in which severe cramps followed the oil injection. By strictly observing the well-known contraindications he saw no complication in an uninterrupted series of 1200 cases although he had previously encountered 4 complications in his first 300 pertubations. In one case a skin emphysema was produced. In another case unilateral pyosalpinx and in two other cases an acute lighting up of gonorrheal adenitis. He is not content with attributing to the presence of such pathologic conditions as myomas, cystomas, infantilism, hypoplasia, conical cervix, hyperanteflexion of the uterus the cause of sterility in any case without first determining the patency of the tubes.

It will be recalled that George G. Ward⁴⁷ reported more than 3000 tubal insufflations from the special sterility clinic which he established at the Woman's Hospital. "In all that long series we have had no serious casualties. That, I think, shows that the test can be used with safety if proper precautions and care are taken."

Reynolds and Macomber themselves state: "Moreover, in the now considerable number of cases in which we have submitted the results obtained by this method to the test of operation we have so far met with no mistaken conclusion."

The cases in which the test was repeated once or twice may be said to be of particularly therapeutic value. The vast majority of these

repeated tests were done because there existed at the first insufflation some abnormality in tubal patency. In a few cases in which the insufflation findings were normal or practically normal it was repeated after coitus or before coitus intentionally for therapeutic reasons.

S. R. Meaker¹⁵ reported three cases of women married and sterile for two, four and ten years respectively in whom pregnancy followed promptly upon the transuterine insufflation of gas. Two became pregnant immediately and the third became pregnant two months after the test. In each case considerable difficulty was encountered in forcing gas through the tubes. This was accomplished in the first attempt in two cases and at a fourth attempt in the third one. Meaker urges that insufflation should be tried as a routine therapeutic measure in all cases where every factor aside from the tubes has been excluded.

Cron¹ states that of 58 patients to whom he had sent questionnaires 14 reported pregnancy. The majority became pregnant after one or two months, some after a second inflation.

Guthmann⁴⁸ reports three pregnancies out of 15 cases who were examined by peruterine insufflation. Charbonnet⁴ reports the case of a woman married six years who became pregnant following a second tubal insufflation in which the gas pressure rose to 180 mm. Hg. In the first attempt the pressure rose to 200 mm. Hg. Aldridge³ reported nine cases of pregnancy out of his first series of 600 cases examined by peruterine insufflation. "Other cases may have occurred but no systematic inquiry had been made." Hirst and Mazer¹² reported three cases "who became pregnant so soon after the insufflation test that we are disinclined to view this phenomenon as incidental."

Geppert⁹ in 1924 collected 30 observations of pregnancy in various publications following tubal insufflation. Marie von Scheller²⁰ in 1926 collected 59 among nine authors. Laurentie and Moussali⁴⁹ conclude that 7 undoubted cases of pregnancy have followed a short time after insufflation out of 550 cases examined. Serdukoff⁵⁰ reported 4 cases out of 64 insufflations. J. O. Polak in a private letter to Douay,⁵ reported 5 cases of pregnancy out of about 100. Of 10 patients in whom the insufflation test was made at a pressure of 200 mm. Hg. the tubes originally closed were forced open by gas. One of these became pregnant. Another developed an ectopic pregnancy five months later. Rongy and Rosenfeld⁵¹ have observed 3 cases of pregnancy after insufflation. Hugo Ehrenfest replying to a questionnaire submitted by Douay,⁵ says that he has encountered a large number of pregnancies after insufflation, several after long standing sterility, proving that insufflation can overcome a tubal obstacle which prevents the passage of the ovum.

Summary of the manometric pressures in the 42 cases of my own series in which insufflation has been repeated follows:

There were 15 cases in which the gas pressure during insufflation was below 100 mm. Hg. on the first test.

There were 9 cases over 100 mm. Hg. and below 150 mm. Hg.

There were 6 cases between 150 mm. Hg. and 200 mm. Hg.

There were 10 cases at 200 mm. Hg.

There were 2 cases above 200 mm. Hg.

In 27 out of the 42 cases of pregnancy in which peruterine tubal insufflation was repeated one or more times the initial pressure reached before tubal patency was established was above 100 mm. Hg. The majority of the 42 had shown high grade stenosis to moderate stricture or spasm on the first or second test. The repeated test was carried out for diagnostic corroboration or therapy. In the future it will be well to bear this in mind. I have to confess to a certain timidity at first in employing the test for therapeutic purposes.

Seventy out of the 205 cases showed manometric pressures over 100 during tubal insufflation; of these 47 showed a pressure of 100 to 150; and 23 between 150 and 200; there were 135 cases in which the pressure was under 100 mm. Hg.

It is interesting to note that of the 15 cases out of the 42 in which the pressures were below 100, 6 belonged to the oligomenorrhea group and received x-ray therapy, the second insufflation following the x-ray therapy. In two other cases the insufflation was repeated after a myomectomy had been done. In two others the test was repeated after a child had been born following the first insufflation. These two patients gave birth to two children, conception having followed insufflation both times in each case. In one of these conception followed the same month. One of these insufflations was done for me by Dr. Harold Bailey.

TUBAL INSUFFLATION FOLLOWED BY LIPIODOL INJECTION

In two of the cases with the high pressures lipiodol was injected after the third test. In the one case after the third test, in the other the insufflation was repeated twice after the lipiodol injection before the patient became pregnant.*

PREGNANCY FOLLOWING SALPINGOLYSIS

In one case, a physician's wife, the insufflation showed kinked tubes at 200 mm. Hg. These were straightened out by laparotomy. Insufflation later proved them to remain patent at 110 mm. Hg. and she became pregnant soon after.

INSUFFLATION REPEATED AFTER IMPROVEMENT IN THE HUSBAND'S GENITAL CONDITION

In several of the normal patency cases the test was repeated after the husband improved under treatment from oligospermia to a normal spermatozoa production. In one of the latter the husband had a rela-

*It would be difficult to appraise the therapeutic efficacy of lipiodol injection in these two cases. But inasmuch as I have had occasion to inject lipiodol in 82 of the cases herein analyzed, and pregnancy followed insufflation and lipiodol injection in these two patients alone, the incidence points to a much greater therapeutic action on the part of the gas insufflation than the oil injection.

tively scanty output of spermatozoa because he gave up his blood for transfusions, and several months after he stopped being a blood donor his wife became pregnant.

INCOMPLETE TESTS

There were 4 cases in which one test was carried out and was considered incomplete. In one (Case 2) the cervical canal was found strictured; the uterine cavity was probably not entered but the patient promptly became pregnant. This case points to the rôle played by the stenosed cervix and the therapeutic effect of the cannula introduced into it. In one case a pressure of 200 was reached. The woman weighed 160 lbs., and as about 60 c.c. of gas was given, only the smallest part of it entered the peritoneal cavity through the strictured or spastic tubes. There was not enough to produce a visible subphrenic pneumoperitoneum or to occasion shoulder pains, and the patient was advised to have the test repeated. But this was not necessary because she became pregnant that month. In another case the gas passed through freely at a lower pressure but not enough gas was introduced to produce the typical subphrenic pneumoperitoneum and shoulder pains. She became pregnant. In another case the first and only insufflation showed a pressure rise to 160 mm. Hg., and all the evidences of patency were not present.

Where the fluoroscope fails to reveal a subphrenic pneumoperitoneum and the pressure is high, I have felt that the diagnosis of patency should be held in abeyance till a second or a third insufflation can establish that fact.

In a fifth case with definite stricture of the tubes in a very obese woman, an ectopic pregnancy developed two years later. (Case 1 under ectopics.)

The second, third or fourth insufflation improved the tubal status in practically all of these 42 cases.

In 12 cases the pressures reached 200 mm. Hg. the first time and were within normal limits the second time.

In 5 cases they showed patency with stenosis the second test, having proved closed or strictured the first time. One of these 5 cases proved to be normal on the third test, and in another case three tests were associated with a pressure of 200 mm. Hg. while the later 4 tests in the same case showed some patency with the pressures ranging between 150 and 200 mm. Hg.

In 4 cases an initial spasm followed by patency was encountered on the second test.

Although 200 mm. Hg. is the high limit of nonpatency as set down in my early work, increasing experience has taught that greater pressures may in some instances open up these tubes. Tubes that resist gas pressure up to 200 mm. Hg. on 3 tests may be said to be definitely

obstructed, yet it will perhaps occasionally happen that a fourth or fifth or sixth insufflation may overcome the obstruction.

The number of tests performed in these pregnancy cases totaled 261 as follows: once in 163 cases; twice in 34 cases; three times in 5 cases; four times in 2 cases; seven times in 1 case.

USE OF THE KYMOGRAPH

The value of the kymograph in these cases cannot be overestimated. Since May, 1925, it has been used in conjunction with tubal insufflation. It is particularly in connection with prognosis and therapy that it affords appreciable aid. Of the 205 cases becoming pregnant 161 were examined with the aid of the kymograph. In 44 cases the kymograph had not been used. Of the 161 cases there was evidence of uterotubal spasm in 5 cases; in 6 cases there was evidence of stricture, and in 9 cases high grade stenosis up to the high limit of closure, i.e., 200 mm. Hg. These cases required 3 tests, in one or two of which some degree of patency was noted.

Thanks to increased experience gained through the aid of the kymograph it has been possible to repeat the test with greater intelligence on the one hand and with more gratifying results on the other.

PRECAUTIONS AGAINST CONCEPTION

In 89 cases no statement as to precautions was made (earlier cases of the series).

In 116 there were data as to precautions against conception.

Seventy-seven took precautions. Of these 77 who took precautions at some time, 67 stopped contraceptive measures for a period of from one to three years; 8 for a period of from three to five years and 2 for a period of from five to seven years.

Thirty-nine did not take precautions. Of these 39, 15 were married for a period of from one to three years; 15 for a period of from three to five years; 7 for a period of from five to seven years; 1 for twelve years and 1 for fourteen years.

The laity is so far educated along these lines that it requires very little persuasion to get married couples, elderly at the time of marriage, to avoid taking any precautions against conception because they realize the short time left to demonstrate their power to reproduce. The reasons for the relatively lowered fertility are to be found in the occasional definite profound changes in constitutional and local regional viscera; e.g., chronic congestions; mental and physical fatigue; vices in diet and rest and exercise; intercurrent diseases, etc.

How does uterotubal insufflation aid the sterile woman?

Peterson and Cron¹ commenting on the therapeutic application of the test from their own experience state that "something more than the mere passage of the gas and the mechanical opening of the tubes

must be considered in trying to explain the higher percentage of pregnancies in those women who had previously conceived (4 out of 6, as against 9 out of 30 primary sterilities).'' Although my series shows a reversal of their results (73 out of 930 secondary sterilities; whereas 132 out of 1070 primary sterilities became pregnant), the fact remains that the exact mechanism by which tubal insufflation aids the sterile woman cannot be explained in a certain number of cases.

For the majority of successful results I ventured in 1925²⁴ to state four ways by which tubal insufflation may act as a therapeutic measure in female sterility.

1. By establishing patency of the genital tract from the external os to the abdominal opening of the Fallopian tubes. Any cervical canal that is patulous to the uterine cannula used in the uterine insufflation is ample for the entrance of spermatozoa. If the external os appears punctate or pinpoint but admits the cannula, this is proof that it is wide enough to allow semen to enter the cervical canal. The cannula at the same time stretches it somewhat, rendering it more patent for a varying period of time. Should coitus take place shortly after this procedure, the spermatozoa must have a better opportunity to enter the uterine cavity.

2. In some cases a mucous plug not visible at the external os but occupying the deeper portion of the cervical canal is expelled after the insufflation and on withdrawal of the uterine cannula. I have the impression that the removal of this mucous plug in this manner may be the important factor in some of the successful cases.

3. By separating mild agglutinations of the folds of the tubal mucosa, by straightening out tortuous tubes, especially of the infantile type, by dislodging a mucous inspissation from a narrow to a wider portion of the tube, by actually separating adhesions at the fimbriated end in cases requiring 150 to 200 mm. Hg. or more, a way is opened for the descending ovum to meet the ascending spermatozoa.

4. Still another factor not to be lost sight of is the psychic impression which peruterine insufflation makes on the patient. Although the exact nervous mechanism is not at present clear, there are women who respond to the physical stimulation of peruterine insufflation through the psyche acting upon the autonomic genital apparatus. Whether it induces a certain amount of relaxation in otherwise spastic tubes, the uterine openings of which are practically closed, must await further inquiry.

That there actually exists in certain tubes spasm sufficient to close the uterine ostium in a manner similar to the closure of the internal os of the uterus has been recently demonstrated. I have been able to convince myself of the presence of spasm in about 4 to 5 per cent of cases and believe that it is very common in the premenstrual interval. Overcoming such spasm may obviously exert a therapeutic influence.

STERILITY AS A SOCIAL WELFARE PROBLEM

Giles²⁶ regards sterility as an expression of a lowered standard of health, and therefore considers it a matter "for considerations of public welfare and also a loss to the nation of unborn children." "It is evident," says he, "that with the limitation of the number of marriages it is increasingly important that the marriages that are consummated should be fruitful."

"If," says Batuaud,⁵² "each medical man in France could restore eight sterile marriages the problem of the population of France would be solved." So that any measure which promotes the general propagation of the species may be welcome.

GENERAL SUMMARY

1. There were 1070 primary sterilities and 930 secondary sterilities. One hundred thirty-two cases of primary sterility became pregnant, and 73 cases of secondary sterility became pregnant.

2. A history of induced and spontaneous abortion was given by 49 patients of the 73 secondary sterilities out of the 205 who became pregnant following tubal insufflation or an incidence of 67 per cent of the secondary sterilities, 31 patients with 38 spontaneous abortions and 18 patients with 26 induced abortions:

3. In 85 of the cases some surgical operation was noted in the history. In 120 no operation was recorded.

4. One hundred eighty-eight had full-term children; 17 had early miscarriages, or 8.3 per cent of the total 205 cases.

5. There were 3 additional pregnancies out of the 2000 cases which resulted in ectopic pregnancy, or one in 666 cases.

6. There were 54 women over thirty years of age, or 27 per cent of the total number who became pregnant.

7. Fifty-nine pregnancies occurred within one month after insufflation and 39 within the second month making a total of 98 cases of pregnancy following insufflation within the first two months or nearly 50 per cent of the cases.

8. Of the 73 relative sterilities 38 had failed to become pregnant for three years following the last full-term pregnancy or abortion; 17 for five years; 11 for seven years; 5 between seven and ten years; and 2 for longer than ten years (1 for twelve years and 1 for fourteen years).

9. In 92 of the 205 cases some adjuvant treatment was resorted to. In 113 cases no other treatment than tubal insufflation was given. The cases that promptly became pregnant were not those receiving gland extracts.

10. In all cases where a pressure of 200 mm. Hg. has been reached the possible occurrence of ectopic pregnancy must be borne in mind.

11. In 154 cases the insufflation was done between the first and the fourteenth day following the cessation of the last period; i.e., in the

preovular phase. This would point to the first half of the menstrual interval as being the more favorable for therapeutic tubal insufflation. This is particularly noted in the 59 cases which became pregnant within one month after the insufflation, 24 of which were insufflated within seven days from the last menstrual period and 25 the second week after the last menstrual period. In other words 87 per cent of these 59 pregnancies followed insufflation when performed within two weeks while 13 per cent followed insufflation done later than two weeks postmenstruum. In 83 per cent of the 49 patients who became pregnant within two months after the last regular period, the insufflation had been done within the first two weeks postmenstruum.

12. Thirty patients who were married from three to five years at the time of treatment became pregnant within one or two months following insufflation; and 26 patients who were married five years or over became pregnant within the first two months following insufflation. This is the best evidence of the therapeutic efficacy of the test.

13. Of the 205 cases becoming pregnant insufflation was done in 42 per cent within one week after the last period and in 75 per cent within the first two weeks after menstruation.

14. In 27 of the 42 cases of pregnancy in which peruterine insufflation was repeated one or more times, the initial pressure reached before tubal patency became established was above 100 mm. Hg. In 12 cases the pressure reached 200 mm. Hg. the first time and within normal limits the second time. Although 200 mm. Hg. is the high limit of nonpatency as set down in my early work, increasing experience has taught that greater pressures may in some instances open these tubes. Tubes that resist gas pressure up to 200 mm. Hg. on three tests may be said to be definitely obstructed. Yet it will perhaps occasionally happen that a fourth, fifth or sixth insufflation may overcome the obstruction.

15. Of 116 cases with definite data as to precautions against conception there were 77 patients who took precautions and 39 who did not take precautions. Of the 77, 67 had taken no precautions for a period of one to three years; 8 for a period of three to five years; and 2 for a period of five to eight years. Of the 39 who did not take precautions, 15 were married for a period of one to three years; 15 for a period of three to five years; 7 for a period of five to eight years; one for twelve years and one for fourteen years.

CONCLUSIONS

That there is a definite therapeutic efficacy of the method may be concluded from the cases in which pregnancy followed tubal insufflation within a month in women over thirty years of age and who were married for a period of five years or more, no treatment other than insufflation having been used and no contraceptive precautions taken

for at least a year. Furthermore the cases in which the initial pressure was high on the first insufflation or was reduced to a relatively normal level by a repeated test just before pregnancy took place also indicate a therapeutic action on the part of the insufflation and thus eliminate the possibility of chance or accidental results.

REFERENCES

- (1) *Peterson, R., and Cron, R. S.*: Therapeutic Value of Transuterine Gas Inflation, J. A. M. A. 81: 980, 1923.
- (2) *Rongy, A. J.*: Primary Sterility, New York M. J. 116: 439, 1922.
- (3) *Aldridge, A. H.*: Insufflation of the Uterus and Fallopian Tubes, AM. J. OBST. & GYNEC. 6: 53, 1923.
- (4) *Charbonnet, P. N.*: The Insufflation Test as a Diagnostic and Therapeutic Agent in Sterility, J. Oklahoma M. A. 17: 36, 1924.
- (5) *Douay, Eugene*: La stérilité d'origine tubaire. (Diagnostic et Traitement) Gynéc. et Obst. 16: 126, 1927.
- (6) *Francillon, Lobrc, M., and Dalsace, J.*: Diagnostic de la stérilité d'origine tubaire; insufflation et injection de lipiodol, Bull. méd. 41: 381, 1927.
- (7) *Fuchs, H.*: Pertubation und Salpingostomie zur Beseitigung der Sterilität, Monatsch. f. Geburtsh. u. Gynäk. 75: 56, 1926.
- (8) *Frommolt, G.*: Unsere Erfahrungen mit der Pertubation, München. med. Wchnschr. 72: 201; 585, 1925.
- (9) *Geppert, F.*: Die Tubendurchblasung in ihrer Beziehung zur Therapie der Sterilität, Zentralbl. f. Gynäk. 48: 1703, 1924.
- (10) *Graff, E.*: Die Unfruchtbarkeit der Frau. Bedeutung der Eileiterdurchblasung für die Erkennung der Ursachen, die Voraussage und die Behandlung, Wien klin. Wchnschr. 39: 78, 1926.
- (11) *Hamant, A.*: L'insufflation tubaire dans le traitement de la stérilité féminine, Rev. méd. de l'est. 55: 193, 1927.
- (12) *Hirst and Mazer*: The Rubin Test and Its Therapeutic Application, AM. J. OBST. & GYNEC. 4: 628, 1922.
- (13) *Kaboth, G.*: Eileiterdurchblasung. Ber. u. d. ges. Gynäk. u. Geburtsh. 12: 129, 1927.
- (14) See reference (6).
- (15) *Meaker, S. R.*: Transuterine Insufflation of Gas in the Investigation and Treatment of Sterility, Boston M. & S. J. 190: 286, 1924.
- (16) *Morkane, C. F.*: Some Observations on Rubin's Transuterine Insufflation of Fallopian Tubes; a Study of 140 Cases, M. J. Australia (supp. 3) 83, 1927.
- (17) *Příbram, E.*: Weitere Erfahrungen mit der Tubendurchblasung, Klin. Wchnschr. 6: 1423, 1927.
- (18) *Romeo, P.*: Sul valore diagnostico e terapeutico dell'insufflazione periuterina delle trombe di Falloppio all Rubin. Riv. d'ostet. e ginec. prat. 8: 92, 1926.
- (19) *Samuel, M.*: Therapeutische Fortschritte durch diagnostische Röntgenaufnahmen des Uterus und der Tuben, Fortschr. a. d. Geb. d. Röntgenstrahlen. 36: 356, 1927.
- (20) *Von Scheller, Marie*: Diagnostische und therapeutische Erfahrungen mit der Pertubation, Zentralbl. f. Gynäk. 50: 990, 1926.
- (21) *Schwarzwallner, G.*: Zu den therapeutischen Erfahrungen mit der pertubation, Zentralbl. f. Gynäk. 50: 2280, 1926.
- (22) *Sellheim, H.*: Wiederbelebung der Sterilitätsforschung durch die Erfindung der Tubendurchblasung, Med. Klin. 19: 1570, 1923.
- (23) *Titus, P.*: The Rubin Test in the Diagnosis and Treatment of Sterility in Women, Atlantic M. J. 30: 216, 1927.
- (24) *Rubin, I. C.*: Diagnostic Value and Therapeutic Application of Peruterine Insufflation of the Fallopian Tubes in Cases of Sterility. (25) *Dickinson, R. L., and Cary, W. H.*: Sterility, Analysis of Cures and Failures, J. A. M. A. 88: 1, 1927.
- (26) *Giles, Arthur E.*: Sterility in Woman, Oxford University Press, London, 1919.
- (27) *Cullen*: A Normal Pregnancy Following Insertion of the Outer Half of a Fallopian Tube Into the Uterine Cornu, Bull. Johns Hopkins Hosp. 33: 344, 1922.
- (28) *Cotte et Bertrand*: L'implantation tubo-uterine, Gynéc. et Obst. 15: 182, 1927.
- (29) *Riess*: Plastic Operation on the Fallopian Tubes, AM. J. OBST. & GYNEC. 2: 180, 1899.
- (30) *Shaw, Henry N.*: Grossesse a la suite d'une implantation du bout extérieur de la seule trompe restante, Bull. Johns Hopkins Hosp. 32: 367, 1921.
- (31) *Unterberger*: Nouvelle contribution a la question de la reimplantation tubaire, Zentralbl. f. Gynäk. 51: 602, 1927.
- (32) *Estes*: Implantation of a Part of an Ovary Into a Horn of the Uterus, Med. Times, 1: 132, 1922.
- (33) *Franck*: Über Transplantation der ovarien, Zentralbl. f. Gynäk. 17: 444, 1918.
- (34) *Mayer*: Zur Wiederherstellung der Konzeptionsmöglichkeit nach Verlust der Eileiter oder Eierstöcke, Zentralbl. f. Gynäk. 48: July, 1924; 49: March, 1925.
- (35) *Morris*: A Case of Heteroplastic Ovarian Graft, Med. Rec. 697, May 15, 1906.
- (36) *Palmer-Dudley*: Communication au Congrès international de Gynec. et Obst. d'Amsterdam, 1899 et Congrès sciences médicales, Paris, 1900.
- (37) *Tuffier et LeTulle*: Transposition de l'ovaire pourvu de son pédicule vasculaire dans l'utérus, Presse Médicale, No. 43: 466, 1924.
- (38) *Reynolds and Macomber*: Fertility and Sterility in Human Marriages, W. B. Saunders Co., Philadelphia, 1924.
- (39)

Malins: The Antenatal Waste of Life in Nature and Civilization, J. Obst. & Gynec. Brit. Emp. 3: 307, 1903. (40) *Taussig*: Prevention and Treatment of Abortion, C. V. Mosby Co., St. Louis, 1910. (41) *Rubin, I. C.*: Sterility Associated With Habitual Amenorrhoea Relieved by X-ray Therapy, AM. J. OBST. & GYNEC. 12: 76, 1926. (42) *Duncan, J. M.*: On Sterility in Women. Gulstonian Lectures Delivered in the Royal College of Physicians, February, 1883, London. (43) *Kaboth, G., and Klecfisch, J.*: Die Konzeptioner Ahrscheinlichkeit in Kinderlosen Ehen. Arch. f. Gynäk. 133: 70, 1928. (44) *Rubin, I. C.*: Most Favorable Time for Transuterine Insufflation to Test Tubal Patency, J. A. M. A. 84: 486, 1925. (45) *Rubin, I. C.*: Diagnostic Use of Intra-Uterine Iodized Oil Injection Combined With X-rays, as Compared to Peruterine CO₂ Insufflation, Radiology, Aug., 1928. (46) *Mandelstam, A.*: 1500 Perturbation Cases, Monatschr. f. Geburtsh. u. Gynäk. 78: 271, 1928. (47) *Ward, George G.*: Discussion of Tubal Patency by Rubin, I. C., A. M. A. J. 90: 99, 1928. (48) *Guthmann, H.*: Weitere Erfahrungen mit der Eileiterdurchblasung (Perturbation). Monatschr. f. Geburtsh. u. Gynäk. 64: 55, 1923. (49) *Laurentie, A., and Moussali, C.*: La methode de l'insufflation des trompes. Rev. franc. de gynéc. et d'obst. 20: 137, 1925. (50) *Serdukoff, G.*: Les Methodes actuelles pour le diagnostic de la sterilite tubaire. Gynéc. et Obst. 14: 111, 1926. (51) *Rongy, A. J., and Rosenfeld, S. S.*: Transuterine Insufflation, AM. J. OBST. & GYNEC. 3: 496, 1922. (52) *Batnaud*: La Sterilite Feminine, Masson & Cie, Paris, 1927.

911 PARK AVENUE.

RADIUM IN THE TREATMENT OF MENORRHAGIA OF ADOLESCENCE AND OF THE MENOPAUSE*

BY LEDA J. STACY, M.D., AND ROBERT D. MUSSEY, M.D.,
ROCHESTER, MINN.

(From the Sections on Obstetrics and Gynecology, The Mayo Clinic)

PREVIOUS to 1832 many bizarre theories were advanced regarding the function of menstruation. In 1832 Negrier discovered that the ovary was related to the occurrence of menstruation and in 1840 Gendren brought forth the theory that menstruation depended on ovulation. Later Pflüger's theory was accepted that menstruation occurred as a result of irritation of the ovarian nerve caused by the distention of the ovary as a result of the swelling of the follicles. This reflex irritation in turn was supposed to dilate the utero-ovarian arteries and so produce pelvic congestion and uterine bleeding. This theory was accepted until Marshall, Jolly and others showed that menstruation persisted following transplantation of the ovaries, establishing the fact that the ovaries were responsible for menstruation and that the stimulating substance must travel by way of the blood stream. This observation led to the work of Papanicoloau, Stockard and Frank and later to that of Allen, Doisy and others, which in turn led to the now accepted hormone theory.

The menorrhagia and metrorrhagia of adolescence and of the menopause in which a demonstrable pathologic lesion is not present would seem to be due to ovarian dysfunction, especially in the former period. In menorrhagia of the menopause other factors, such as repeated preg-

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

nancies, low-grade chronic endometritis, hypertension, or fibrosis of the uterine muscle may play a part. The effect of the beta and gamma rays of radium on the endometrium and on the ovarian follicles has established radium as a valuable adjunct in the control of uterine bleeding. In this study only the histories of those patients treated with radium in whom pelvic lesions were not found were selected.

Perhaps the policy in The Mayo Clinic may have been overly cautious in the use of radium in the management of menorrhagia and metrorrhagia of adolescence. Radium has been used in these cases only when all medical measures have failed to control the loss of blood and when the persistent anemia or the incapacity of the patient necessitated more radical treatment. Fifteen unmarried patients between the ages of fourteen and twenty-one were given radium for menorrhagia from 1916 to 1927 inclusive. In 7, menstruation had been irregular since its onset; in one, the periods were regular but prolonged and in 7 the periods had been irregular for from one to four years, the flow in 3 having been continuous for more than six months. The onset of menstruation was somewhat delayed; in 4 patients, the catamenia occurred at the age of fifteen and in 5 at the age of fourteen; menstruation was established at the age of thirteen in 4 and at twelve years in 2.

It is perhaps significant, in view of the endocrine theory, that only 2 of these girls were overweight, between 145 and 150 pounds, in contrast to the large proportion of girls having scant menstruation or amenorrhea who are overweight. Six of the girls weighed less than 110 pounds and 6 weighed between 110 and 125 pounds. The weight of one was not mentioned. In most of the cases treatment for menorrhagia had been given without permanent benefit before radium was used. In 6 cases treatment by glandular extract had been more or less consistent. In 11 cases the uterus had been curetted; in one the uterine ligaments had been shortened; in 2 hysterotomy had been performed; in one case immediately preceding, and in one nine months previous to the application of radium. In one case a polyp had been removed a year previously and in one an ovarian cyst had been punctured during operation for appendicitis. In all of the cases menorrhagia or metrorrhagia had recurred. On bimanual examination, the uterus was found to be in the usual anterior position in 11 cases and retroverted in 4; the organ was considered to be of normal size in all but one case, in which the size of the uterus was graded 3. Abdominal hysterotomy was performed in this case but only extensive polypoid endometritis was found. In 2 cases the ovaries were found to be enlarged on bimanual examination.

The loss of a moderate amount of blood or even a slight amount over a long period of time often produces more marked secondary anemia than the loss of large amounts of blood at fairly long intervals. In 5 cases, the hemoglobin was below 40 per cent and in 3 it was between 50 and 60 per cent; 2 patients were given a transfusion previous to the

use of radium. Transfusion may control menorrhagia of this type but these 2 patients had come a long distance and the hemorrhage had lasted so long that it did not seem advisable to rely on transfusion alone.

The amount of radium used varied from 100 to 700 mg. hours. Three patients received 100 mg. hours, five 150, four 200, one 300, one 520, and one 700.

In the small group of adolescent cases, the results were not uniform and it would seem impossible to determine a uniform dosage. One patient was given 150 mg. hours, without improvement, and another who received the same amount ceased menstruating for three years. The results are shown in Table I.

One patient improved for six months, then the menorrhagia and metrorrhagia returned, increasing in severity, and the uterus became large and soft. Hysterectomy was performed three years after the application of 100 mg. hours of radium and the pathologic diagnosis was carcinoma of the fundus. This patient is well nine years after the operation. Hysterectomy was performed elsewhere on one patient three years after 150 mg. hours of radium had been given. In two cases, radium was repeated. One patient received 340 mg. hours three years after the initial dose of 100 mg. hours and the periods then became normal. The other patient, after receiving 150 mg. hours, returned a year later and was given 225 mg. hours; she has reported that menstruation is normal but less frequent. One patient receiving 200 mg. hours improved for one year, then the profuse flow returned, following which exploratory hysterotomy was performed, the ligaments shortened and a cyst of the ovary punctured. The periods are now irregular but less profuse. One patient who received 520 mg. hours of radium did not menstruate for six months, then menstruated once, the period lasting three weeks. Further report has not been received from this patient. One patient who received 125 mg. hours has scant menstrual flow every six weeks. One patient who received 150 mg. hours did not menstruate for three years, then began to flow profusely and a pelvic operation (nature unknown) was performed elsewhere. One patient who received 200 mg. hours of radium reported improvement; another patient given 700 mg. hours menstruated twice normally, then the flow became profuse and radium was applied to the spleen. The menorrhagia was not controlled. Operation (nature unknown) was performed elsewhere two years later. The menstrual periods of four patients became regular and normal; two of these received 150 mg. hours each, one 300 mg. hours and one 200 mg. hours.

During or near the menopause conservation of ovarian function may be disregarded and sufficient radium can be given to produce permanent cessation of menstruation. It is in this group that radium gives the most satisfactory results in controlling the menorrhagia. The one

TABLE I. THE APPLICATION OF RADIUM DURING ADOLESCENCE

CASE	AGE	MILLI-GRAM HOURS	PREVIOUS TREATMENT	RESULT
1	17	100	Thyroid extract, iron, rest.	Improved for six months, then gradually increasing metrorrhagia; abdominal hysterectomy three years later; carcinoma of fundus; well now nine years after hysterectomy.
2	18	100	Corpus luteum with temporary improvement.	No change; three years later 340 mg. hours; periods normal since; gained strength and weight.
3	18	150	Corpus luteum with some improvement; curettage one year before and preliminary to radium.	Return of profuse flow after treatment; hysterectomy elsewhere three years later.
4	19	200	Short treatment with corpus luteum; curettage two years before and preliminary to radium.	Improved one year; profuse flow returned; gained 17 pounds, exploratory hysterotomy; ligaments shortened; ovarian cyst punctured; periods improved but still irregular.
5	18	520	Ligaments shortened; curettage two years and one year before.	Periods ceased for six months, then one period of three weeks' duration; no report since.
6	17	200	Curettage two years before; hysterotomy; curettage and rupture of ovarian cyst preliminary to radium.	No report.
7	18	125	Ovarian extract for six weeks; curettage eight months before and preliminary to radium.	Small amount of flow every six weeks; general health fair.
8	20	200	Curettage; removal polyp one year before; roentgen ray for one year; no benefit.	Some improvement.
9	16	150	Curettage two years and one year before; hysterotomy preliminary to radium.	Flow ceased after two weeks for three years; returned profuse; pelvic operation elsewhere (nature unknown) three years later; gained strength but not weight.
10	19	150 (225 1 year later)	Mammary gland extract; curettage five months before and preliminary to radium.	Flow stopped for a time, then re-established but periods far apart; gained strength and weight.
11	19	700	Curettage one year, and again six months before.	Two normal periods then profuse again; radium to spleen without benefit; operation elsewhere two years later; improved since.
12	15	150	Curettage one year before without relief.	Periods ceased six months, then regular and normal; gained strength but not weight
13	18	150	None recorded.	Periods every six to seven weeks for five to six days; gained weight.
14	20	300	Curettage preliminary to radium.	Periods regular and normal; gained weight.
15	20	200	Ovarian tablets for four months.	Periods regular and normal; gained strength.

definite contraindication to its use is the history or local evidence of previous pelvic infection.

During the years 1920 to 1924 inclusive, 284 women, in whom fibromyomas were not detected by examination, were treated at The Mayo Clinic for menorrhagia during the menopause. The average age of these women was forty-five and seven-tenths years; 54 were between fifty and sixty. Of the 270 married women, pregnancy had occurred in 251 (92.96 per cent); 239 (95.21 per cent) of these had had children. Nineteen (7.03 per cent) of the married women had not been pregnant and twelve (4.76 per cent) had had miscarriages and full-term pregnancies had not occurred. There was one ectopic pregnancy. Although there may not be an etiologic relationship with intercurrent infection 100 (35.21 per cent) of the patients had had influenza.

TABLE II. AMOUNT OF RADIUM USED AND RESULT OF TREATMENT

RESULT OF TREAT- MENT	RADIUM IN MILLIGRAM HOURS												TOTAL
	250-450		500-750		800		1000		1200		1400-1500		
	PATIENTS	PER CENT	PATIENTS	PER CENT	PATIENTS	PER CENT	PATIENTS	PER CENT	PATIENTS	PER CENT	PATIENTS	PER CENT	
Periods ceased immediately	3	37.5	98	80.9	11	91.6	10	90.9	57	91.9	28	93.3	207
Periods irregular, amount normal	2	25.0	13	10.7	1	8.3	1	9.0	2	3.2	1	3.3	20
Periods irregular and profuse	2	25.0	5	4.1					1	1.6			8
Normal periods	1	12.5	2	1.6							1	3.3	4
Second radium treatment re-quired			2	1.6									2
Hysterectomy performed later			1	0.8					2	3.2			3
Total	8		121		12		11		62		30		244

Prolonged and profuse menstruation had occurred in 188 cases (66.19 per cent), in 33 (11.61 per cent) bleeding had been continuous, and in 162 (57.04 per cent) the periods were irregular. Curettage performed previously had failed to relieve the menorrhagia in 55 cases and in 124 curettage for diagnosis was performed preliminary to the use of radium. In two cases myomectomy had been performed and in one case partial hysterectomy for fibromyomas. In 6 cases, intrauterine polyps had been removed. One ovary was removed in one case and in 9 cases partial oöphorectomy was performed.

In the group of patients who were passing through the menopause, 207 (of the 244 heard from) ceased menstruating immediately following the use of radium. Twenty patients menstruated irregularly but profusely and four menstruated normally. Two patients were given second doses of radium. Hysterectomy was performed on three patients because of recurrence of symptoms.

In the group of 8 patients given 250 to 450 mg. hours of radium, 3 ceased to menstruate immediately, 2 menstruated normally but irregularly, 2 menstruated irregularly and profusely, and one menstruated normally.

In the group of 121 patients given 500 to 750 mg. hours of radium, 98 ceased to menstruate immediately; 2 again menstruated normally; 5 experienced a return of profuse menstruation, 2 of whom were given subsequent applications of radium, one, one year later and one, nine months later and then ceased menstruating. Thirteen menstruated irregularly from two to seven years and then menstruation ceased. Two of these patients died, one from pernicious anemia and one from pneumonia; hysterectomy was performed one year later on one patient and a pathologic diagnosis was made of a malignant lesion in the fundus.

In the group of 12 patients given 800 mg. hours of radium, 11 ceased to menstruate immediately; one patient menstruated irregularly but less profusely, and reports have not been received from 2 patients.

In the group of 11 patients given 1000 mg. hours of radium, 10 ceased to menstruate immediately; one of these patients died from embolus following an operation for bunions elsewhere two years later; one menstruated irregularly, and reports were not received from 5 patients.

In the group of 62 patients receiving 1200 mg. hours of radium, 57 ceased menstruating immediately; one of these died three years later from apoplexy. Hysterectomy was performed elsewhere on one patient for hemorrhage three years later; 2 patients menstruated irregularly; one patient menstruated profusely and irregularly for five years and then menstruation ceased. Reports were not received from 13 patients.

In the group of 30 receiving 1400 mg. hours of radium, 28 ceased menstruating immediately, one patient menstruated irregularly for a year and then menstruation ceased, and one patient menstruated normally.

Two patients received 1600 mg. hours of radium. One ceased to menstruate immediately; a report was not received from the other.

CONCLUSIONS

1. In the adolescent period, radium should not be used until after all general and other accepted measures of treatment have failed. The dose should be small enough to preclude any possible injury to the ovary. It is better to err on the safe side and repeat the dose several months later if necessary than to use a dose which might permanently injure the ovarian tissue. Although it is hard to establish a definite dosage, we believe that not more than 200 to 250 mg. hours should be used in the initial treatment.

2. It is evident that the use of radium is of distinct value in controlling menorrhagia of the menopause.

3. From 800 to 1000 mg. hours of intrauterine radium in a single dose gives satisfactory results in more than 90 per cent of patients treated.

4. The history of pelvic infection even eight or ten years previously or evidence of pelvic infection is a definite contraindication to the use of radium.

5. Preliminary curettage for diagnostic purposes should be carried out in practically all cases in which the patient is more than forty years of age.

THE RADIUM TREATMENT OF FIBROIDS AND FIBROSIS UTERI*

BY FREDERICK A. CLELAND, B.A., M.B., F.A.C.S., TORONTO, CANADA

IT IS thirty years since the discovery of radium and twenty-eight since Walkhoff first recorded the reaction produced on human tissues by this peculiar element. Robert Abbè says he treated fibroids with radium as early as 1905, but the first report of its action on uterine fibromas and chronic metritis was made in 1906 by Oudin and Verchère. The pioneer work in America was done largely by Kelly and Burnam, Clark, and Norris and Keene. Many others have confirmed the results of their observations and certainly enough work has been done in the last fifteen or twenty years to warrant us making very definite conclusions as to the value of radium to the gynecologist. In the treatment of certain conditions the use of radium is now upon a firm foundation and early prejudices are no longer justifiable.

When our president asked me to take the subject of radium in the treatment of fibroids, and I began to examine my records, I felt that it would give a wrong impression were I to confine my observations only to the treatment of uteri in which definite fibroids could be demonstrated, leaving out those cases in which radium is especially applicable, that is, the bleeding and enlarged uteri where no nodule is present, the so-called fibrosis uteri. Therefore, in presenting a series of two hundred cases treated by radium from January 1, 1922, to December 31, 1927, I have divided them into two classes, namely, fibroids and fibrosis uteri. The term fibrosis uteri is, perhaps, not an ideal one but it seems to be the best at hand and that most commonly used in America. I believe it was first used by Bland-Sutton in 1899 in defining chronic metritis or fibrosis uteri, in which the leading feature is menorrhagia, which cannot be controlled by drugs, tampons, or curettage. He described these uteri as presenting striking structural changes, the organ being larger than usual and walls thick and tough. Other writ-

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

ers before Bland-Sutton have described chronic metritis and subinvolution but as far as I know none of them used the words fibrosis uteri. Since then many investigators, including Findley, Gardner and Goodall, Shaw, Donald, Rabinovitz, Novak, Geist and Scott, have made contributions to the literature regarding the etiology of this condition. It must be admitted that the etiology is not yet settled and that no definite pathologic findings are constantly present. I choose to use the name of fibrosis uteri as a clinical term rather than a pathologic entity. In every case which I am reporting as fibrosis uteri, the uterus was definitely enlarged, having thick dense walls and no nodule. I have excluded all cases of idiopathic or myopathic bleeding in which the uterus did not show enlargement.

In the tables given the cases are entirely from private records. It was found impossible to investigate and follow up public hospital cases with sufficient accuracy, and we gave up the attempt. The 207 cases treated surgically are also from private records, and include all cases of fibroids operated upon during the same period.

In the 200 cases treated by radium the technic was practically uniform. The cervix was dilated and a diagnostic curettage done, after which the uterine cavity was wiped out with gauze. The radium needles were screened with 1 mm. of brass and 1.6 mm. of gray rubber tubing, and accurately placed in the uterine cavity and held securely in position by a catgut suture through the cervix and rubber tubing, or by plain gauze packing. If sutured in position, a full length catgut suture was used, and tied by a slip knot, easily loosened when the radium was removed.

Table I shows age incidence and is made in conformity with that of other writers. It shows 50 patients under forty years of age; but of these, 22 were over thirty-eight years. It is a point worth noting therefore that over two-thirds of all our cases were between the ages of thirty-eight and fifty.

TABLE I

AGES	NO. OF PATIENTS	MENOPAUSE INDUCED IN
20 - 30	9	3
30 - 40	43	25
40 - 50	117	113
50 - 60	26	25
60 - 70	5	Menopause before radiation
Total	200	

Of these 200 cases 98 were diagnosed as fibrosis uteri.

FIBROSIS UTERI CASES

In all of these patients the uterus was larger and denser than normal. The 98 patients were distributed according to ages as follows, and Table II also shows the number of patients in whom the menopause was induced.

Only 15 of these were under thirty-eight years of age. Of the 98 patients 13 or about 14 per cent were unmarried. Many of the married patients had had a number of children, as is shown in Table III, and probably subinvolution was an etiologic factor.

TABLE II

AGES	NO. OF PATIENTS	NO. OF PATIENTS IN WHOM MENOPAUSE WAS INDUCED
20 - 30	5	1
30 - 40	22	15
40 - 50	54	52
50 - 60	14	14
60 - 70	3	Menopause previous to treatment
Total	98	

TABLE III

	0 CHILDREN 0 MISCARRIAGES	MISCARRIAGES ONLY	1 CHILD	TWO CHILDREN	3 TO 5 CHILDREN	MORE THAN 6 CHILDREN
No. of patients	6	4	8	20	35	7

The family history of 5 patients was unknown. Seventy-seven per cent of the married patients whose family history was known had had 2 or more children.

Twenty-two of the 76 married patients whose family history was known had had one or more miscarriages. The 15 patients under thirty-eight years are discussed elsewhere. In *all* the older patients of this group, the results were successful. The majority of the patients received doses of from 1200 to 1500 mg. hours. In a few patients where the uterus was particularly large, as much as 1700 to 1900 mg. hours were given. In all but one of these patients the menopause was induced. In this one exception the excessive bleeding was controlled and normal menstruation followed. One application of radium was 100 per cent successful in these 83 patients over thirty-eight years of age, nearly all of whom had had several children, and were suffering from marked menorrhagia.

FIBROID CASES

Many of the fibroids were small, but many were intramural as large as a three months' pregnancy. A few larger than a three and a half months' pregnancy gave good results, but as a rule it is considered that tumors of that size are better treated by surgical removal. The distribution of these cases according to age as shown in Table IV does not differ markedly from that shown by the fibrosis uteri cases.

Only 13 of these were under thirty-eight years of age. Of the 102 patients, 17 were unmarried. Many of the married patients had had

large families, only eight had had no pregnancies, and 65 per cent had had more than two children, not as high a percentage as that among the fibrosis uteri cases.

TABLE IV

AGES	NO. OF PATIENTS	NO. OF PATIENTS IN WHOM MENOPAUSE WAS INDUCED
20 - 30	4	2
30 - 40	21	8
40 - 50	63	61
50 - 60	12	10
60 - 70	2	Menopause previous to radium
Total	102	

TABLE V

	0 CHILDREN 0 MISCARRIAGES	MISCARRIAGES ONLY	1 CHILD	TWO CHILDREN	3 TO 5 CHILDREN	MORE THAN 6 CHILDREN
No. of patients	8	3	18	21	25	7

The family history of three patients was unknown. Twenty-nine, or 35 per cent of the 82 married patients whose family history was known, had had miscarriages, a normal percentage probably. Lockyer and others have found that sterility is twice as common among married women with fibroids as among married women without these growths. Also the risk of abortion is much increased. Our figures did not confirm his findings.

With these cases the proper dosage was more difficult to gauge, but it varied with the size of the tumor. We aimed to bring on the menopause, as this seemed to be necessary for effective treatment. Most of the patients received a little more than the fibrosis cases, usually about 1400 to 1500 mg. hours. A few were given 1200 mg. hours, and a few others received from 1900 to 2100 mg. hours. One whose uterus was the size of a four and one-half months' pregnancy received 3680 mg. hours with satisfactory result. As a rule patients around thirty-eight to forty years need larger doses to induce the menopause than those nearer their natural climacterium; at that time a very small dosage may be sufficient.

Unsuccessful Results.—In nine of these patients the treatment was unsuccessful, and in seven, hysterectomy was performed without mortality, four by other surgeons and three by myself. In most of these cases the reason for the poor result was later evident. (See Table VI.) In two patients the fibroid underwent degeneration, as examination after removal proved. Another had a submucous fibroid about the size of a small walnut, which was not detected at the time the radium was used. Two were underradiated. In the sixth patient the tumor rapidly increased in size and caused death three months after radia-

tion. It was probably sarcoma, although the scrapings were negative; no further operation was done and no postmortem allowed. The seventh patient, a woman of sixty-two years, weighing over 250 pounds, had a very large fibroid extending half way to the umbilicus. This tumor was probably too large for radiation, but as the bleeding was never profuse, the patient did not want any further treatment. In the remaining two cases no reason for the failure was known.

TABLE VI

	DEGENERAT- ING FIBROIDS	SUB- MUCOUS	UNDER- RADIATION	UNDIAGNOSED MALIGNANCY	TOO LARGE	NO KNOWN CAUSE
No. of patients	2	1	2	1	1	2

The patients under thirty-eight years of age should be discussed as a group by themselves, as in many instances it was our aim to control the excessive bleeding, always the main symptom, without stopping the menses permanently. As the menorrhagia had been of long duration, the menopause was brought on in ten of these twenty-eight patients, all intentionally, excepting one. These patients received 900 to 1500 mg. hours. In the remaining 18 patients, doses varying from 500 to 1500 mg. hours caused amenorrhea for from two to twelve months. In only one was treatment ineffectual. This patient, aged twenty-five, a case of fibrosis uteri, had no periods for three months after 900 mg. hours, but then bled severely again. Further radiation was advised but disregarded.

Doses up to 900 mg. hours apparently can be given with safety and half of these women were successfully treated with doses varying from 1000 to 1500 mg. hours. Three of these patients or 10 per cent subsequently became pregnant, two of whom gave birth to living children.

SYMPTOMS BEFORE AND AFTER RADIATION

1. *Bleeding*.—All of the 200 women except three complained of abnormal bleeding, usually beginning as a menorrhagia but frequently becoming almost continuous. A few had bleeding come on after menopause. Of the three who had no unusual bleeding, one had had frequent miscarriages, and a fibroid so low that myomectomy was considered impossible; the other two complained only of abdominal discomfort and were exceedingly poor operative risks because of myocardial disease. In 95 per cent of the patients the bleeding was controlled by one application of radium. The patients had to be warned that the radium took some time to accomplish its work and two or three menstrual periods might come on before the desired result was established. Table VII shows the number of menstrual periods that the women in this series had after radiation.

More than half of the patients had no bleeding after radiation. If the treatment is given shortly after the last period there is less likeli-

hood of the next menses coming on. If it is applied a few days before a period the next flow is apt to be particularly profuse.

TABLE VII. MENSES AFTER RADIATION BEFORE ALL BLEEDING STOPPED

	NONE	1 PERIOD	2 PERIODS	3 OR 4 PERIODS	12 TO 18 PERIODS
No. of patients	103	34	18	10	4

2. *Climacteric Symptoms*.—In the questionnaires that were sent to the patients, they were asked if they had had hot flushes and if so how severe these had been. This climacteric symptom was chosen because it is probably the most constant and the most easily described. Undoubtedly the patient's estimate of the severity of her symptoms depends considerably on her temperament. The answers to this question are summarized in Table VIII.

TABLE VIII. HOT FLUSHES IN ALL THE PATIENTS IN WHOM THE MENOPAUSE WAS BROUGHT ON

	NONE	MILD	SEVERE	NOT DESCRIBED
No. of patients	31	73	58	4

Even at the natural menopause great variation in the symptoms occurs, and it is not felt that these results were at all abnormal. Danforth came to the same conclusion. Stevens and Weiss claim that the symptoms are less severe than those seen at the normal menopause.

3. *Leucorrhea*.—In the whole series 84 complained of leucorrhea before they were radiated. In describing this symptom there is also a great personal variation. On examination 162 showed definite signs of endocervicitis, and in all of these the cervix was cauterized after dilatation. That this treatment is successful is evidenced by the fact that only 31 had any discharge after it and in two-thirds of these, this lasted but a few weeks. Six months or more elapsed before the watery discharge disappeared in the other ten.

4. *Pain*.—None of these patients complained of pain. Pain other than dysmenorrhea is a contraindication to the use of radium. Three young patients who suffered from marked menstrual pain were relieved of this symptom when the menses returned following the temporary amenorrhea. Naturally those in whom the menopause was induced suffered from this symptom no longer.

REDUCTION IN SIZE OF TUMORS OR THE UTERUS

Only in a comparatively few of the cases (30) were bimanual examinations made after the radiation. In all but four of these the uterus or the fibroid was considerably smaller even after as short a period as two months. In two cases where the uterus did not decrease in size

the finding was of importance. In these patients after some months, the fibroid was found to be degenerating and hysterectomy had to be performed.

COMPLICATIONS

One patient developed pelvic cellulitis with severe pain two weeks after treatment, which necessitated six weeks longer in hospital. A second had a severe pyelitis three days after radiation, which prolonged her stay in hospital about two weeks.

MORTALITY AND MORBIDITY AS COMPARED WITH SURGERY

In the 200 cases there was one death, and this occurred from an embolus on the ninth day after radiation. The patient was a large woman weighing about 190 pounds, very anemic and her uterus was about as large as a three and a half months' pregnancy, with several distinct fibroids posteriorly. It was felt that the tumor was about the largest size possible for radiation, but as she was a poor surgical risk, radium should be tried first.

During the same six years the following operations were performed for fibroids:

TABLE IX

TYPE OF OPERATION	NO. OF PATIENTS	NO. DEATHS	PER CENT DEATHS
Supravaginal Hysterectomy	153	5	3.3
Total Hysterectomy	29	0	0.0
Myomectomy	25	0	0.0
Total	207	5	2.4

One should remember, however, that the more dangerous types of fibroids, for example those undergoing degeneration, can only be treated by surgical removal and these naturally raise the mortality rate.

We have no definite figures on the comparative morbidity of radium and surgery, but whereas hysterectomy or myomectomy means two to three weeks in the hospital, radium treatment after dilatation, diagnostic curettage, and cauterization mean only four or five days with no special nursing required.

CONTRAINDICATIONS TO RADIUM

1. Fibroids larger in size than a three and a half months' pregnancy are considered unsuitable for radiation. A fibroid which is causing pressure symptoms such as urinary frequency, difficulty in defecation or unilateral edema of the leg should not be treated with radium.

2. The presence of adnexal disease or ovarian tumor prohibits the use of radium. Some gynecologists refuse to use radium in any individual who gives any history of previous adnexal disease, even though it may have occurred many years previously, but this seems to be excessively cautious. Provided there is no tenderness and no palpable masses are present one may proceed with the treatment.

3. Any symptom which suggests that the fibroid is undergoing degeneration should warn one not to use radium, for example, soft, rapidly enlarging or tender tumors, especially if associated with slight fever and leucocytosis. Pain is usually a symptom of degeneration. Fibroids which have become calcareous are not benefited by radiation. Secondary anemia more marked than that due to the loss of blood is usually indicative of degeneration.

4. Subperitoneal fibroids are usually not suitable and may be caused to degenerate by such treatment, because of fibrosis of the pedicle with subsequent reduction of the blood supply. Submucous fibroids are also better treated surgically.

5. If there is any uncertainty of diagnosis the tumor should be investigated surgically.

6. In young women myomectomy if possible should be done in preference to radiation.

7. If there is any coincident pathologic condition in the abdomen which requires operative treatment, the entire operation should be carried out surgically and not combined with radium.

The value of any therapeutic agent is determined by its end-results. While one is undoubtedly influenced by the opinion of others, one's own experience must be the best and safest guide, and my conclusions are drawn from my own end-results.

Of all cases of fibroids and fibrosis uteri which require treatment, I find about 25 per cent are fibrosis uteri cases, for which radium is the safest and most economical treatment, 75 per cent are fibroids, and of these only about one-third are suitable for radiation; the balance must be treated surgically.

In the fibrosis uteri cases my results with radium show practically 100 per cent success, and I feel that it ought to be strongly emphasized that one is hardly justified in treating them otherwise.

A careful study of our best authorities shows an unanimity of opinion that radium therapy has a definite place in the treatment of fibroids, and that the type of case to which it is applicable has become well standardized. We must, however, always insist on the importance of correct differentiation between the indicated and the contraindicated types and that radium be applied only by an experienced gynecologist or a radium specialist in cooperation with him. Frequently the choice of treatments cannot be made until after examination under anesthesia, and the patient's permission should have been obtained by the surgeon to proceed as he thinks best.

It should be an absolute rule that a diagnostic curettage be done in every case of uterine hemorrhage before radiation. In six cases not counted in the present series. carcinoma of the body was discovered by the curettage, one of these in an unmarried woman of twenty-nine. And

it is universally accepted that panhysterectomy is the best treatment for carcinoma of the body of the uterus.

Radium and surgery should not be in competition. We must determine what is best for each case and should be careful not to generalize too much. However, end-results are so satisfactory in those cases where radium may replace surgery that I am convinced that every gynecologist should be equipped with radium of his own, or be able to obtain its use just as he is with the knife or cautery. He should carefully perfect himself in its technic and be as confident in treating a case with radium as he would with surgery.

REFERENCES

- Bland-Sutton*: Brit. M. J. 1: 839, 1899. *Walkhoff*: Photo, Rundschau, October, 1900. *Giesel*: Ber. d. d. Chem. Ges. 33: 3570, 1901. *Danlos*: Bull. et mem. Soc. med. d. hôp. de Paris, 30, 22: 459, 1905. *Findley, Palmer*: Am. J. Obst. 52: 1905. *Oudin and Verchère*: Comp. rend. 143: 90, 1906. *Abbè, R.*: Am. J. Obst. 69: 360, 1914. *Kelly and Burnam*: J. A. M. A. 63: 622, 1914. *Clark, J. G.*: Surg. Gynec. Obst. 26: 619, 1918; J. A. M. A. 73: 957, 1919. *Titus, E. W.*: AM. J. OBST. & GYNEC. 1: 685, 1920. *Scott, W. A.*: AM. J. OBST. & GYNEC. 2: 479, 1921. *Clark, J. G., and Keene, F. A.*: J. A. M. A. 79: 546, 1922. *Gellhorn, G.*: J. A. M. A. 78: 259, 1922; J. Missouri M. A. 22: 129, 1925. *Heaney, N. S.*: Surg. Gynec. Obst. 35: 625, 1922. *Graves, W. P.*: AM. J. OBST. & GYNEC. 9: 445, 1925. *Muir, J.*: Radiology 5: 147, 1925. *Smith, W. S.*: Surg. Gynec. Obst. 40: 598, 1925. *Weiss, E. A.*: AM. J. OBST. & GYNEC. 11: 343, 1926. *Polak, J. O.*: AM. J. OBST. & GYNEC. 12: 781, 1926; Wisconsin M. J. 26: 391, 1927. *Miller, C. J.*: Am. J. Roentgenol. 16: 228, 1926. *Neill, Wm. Jr.*: West. Virginia M. J. 23: 526, 1927. *Stevens, J. T.*: Physical Therap. 45: 221, 1927. *Giles, A. E.*: Post-Grad. M. J. 2: 49, 1927. *Swanberg, H.*: Illinois M. J. 51: 116, 1927. *Lockyer, C.*: Clin. J. 17: 325, 1928. *Danforth, W. C.*: AM. J. OBST. & GYNEC. 6: 172, 1923.

131 BLOOR STREET WEST.

THE EFFECTS OF X-RAY AND RADIUM UPON THE FETUS IN UTERO*

BY PERCY W. TOOMBS, M.D., MEMPHIS, TENN.

CONCERNING the effects of radiation upon living tissues and embryonic life we have heard much. A vast number of reports of experimental work along these lines is on record. Since it was first suggested that the x-ray might be used in the diagnosis of pregnancy, the possibility of injuring the fetus in utero has been visualized, but the amount of experimental work carried out to demonstrate the truth or falsity of this contention is insignificant in comparison with that produced in connection with other biologic questions brought up by the continually increasing employment of radiation in therapeutics.

It early became known that exposure of the generative system to continued dosage of either x-ray or radium would produce sterility in human beings. This was first observed in practice and then experimentally demonstrated upon animals. Workers with these media then

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

took measures to protect themselves as they carried on their activities, and in treating patients the possibility of producing sterility came to be debated regularly as one of the drawbacks to treatment which must of necessity involve the genital organs. Chiefly was this true when women of child-bearing age must undergo treatment for benign uterine tumors. Carcinoma of the uterus seldom occurs in women still young enough to bear children. A few instances of malignancy complicating pregnancy are reported in literature, but it must still be looked upon as an occurrence of comparative rarity. Fibroids of the uterus, on the other hand, are exceedingly common in women still in the child-bearing period of life. When a woman has attained menopausal age, cessation of menstruation and enlargement of the uterus may indicate either tumor growth or pregnancy. Differential diagnosis is by no means easy even when no untoward symptoms are present. When pathologic conditions are in evidence, which may or may not be the result of tumor growth or pregnancy, the diagnostician's perplexities are greatly increased. The continually extending employment of the x-ray for the diagnosis of pregnancy, and of radium and x-ray for the treatment of fibroids, introduces a still further element of confusion, as well as adding a very real danger to a condition which at best is hazardous alike to the patient's life and the physician's diagnostic reputation.

The possibility, as well as the wisdom of voluntarily producing sterility in women still capable of having offspring, has as a result been very much debated. We have had a multitude of reports concerning women subjected to radiation for one reason or another who have later become pregnant, with detailed examinations of the condition presented by the resulting progeny—mental, physical and spiritual. We have experimented and reasoned all the way from Mrs. Common-or House-Mouse to the married graduates of our leading coeducational universities, and the evidence deduced is so contradictory and confusing that we know but little more than when the inquiry began.

When I first set out to collect data concerning the possibility of injury to the fetus *in utero* by exposure of the mother to radiation, a long list of references was quickly gathered. But when the material thus made available was carefully examined, I found that the part actually related to my subject was almost negligible and that this particular phase of a decidedly extensive inquiry has hardly been touched upon. Moreover, no definite distinction is made by the majority of writers between the effect which radiation might have upon progeny conceived and matured by a mother subjected to radiation, and the effect which radiation applied directly to the fetus after conception and partial maturity had taken place might have upon that fetus. Yet this distinction seems to me perfectly clear, and, moreover, so highly important that in the end I had to reject the great bulk of the data collected as not pertinent to the subject in which I

was interested. My concern is with the fetus primarily, with the mother and the maternal organs only secondarily. This differentiation was insisted upon by Driessen, who wrote of the effect upon the maternal organs, particularly the damage that might be suffered by the follicle or the ovum previous to fertilization. Some of his experiments, however, had to do with the effect upon the fetus in utero, and I shall therefore refer to them again a little later.

Let us first consider what the results of animal experimentation have contributed toward elucidation of the question before us. Several authors have already tabulated this, so I shall take the liberty of making use of their conclusions.

Bailey and Bagg, writing in 1923, reported the results of their own experiments with irradiation with radium and added a number of instances where the condition of the fetus subjected to x-ray radiation while in the uterus had been studied postpartum. They aver positively that "the results of experimental studies in this field are conclusive in agreement that detrimental disturbances occur in animals that are exposed to a sufficient amount of irradiation during the various stages of development. This is probably due to an arrest in the orderly sequence of embryonic processes, and the type of resulting monster is apparently determined by the developmental period at which the exposure is given."

Pregnant rats when exposed to radium irradiation near the end of the gestation period afterward gave birth to young which either died shortly after birth, or showed deformities. The surviving young had brains with practically no cerebral cortex, their eyes were sightless, and they later proved sterile in both sexes. The intravenous injection of an active deposit of radium emanation was also used by Bagg in his experiments, the usual dose being about five millicuries of radium emanation. These injections invariably produced either death and absorption of the fetus or abortion, depending upon whether the radioactive substances were used early or late in the gestation period. Subcutaneous areas of extravasation which characterized some of the surviving young were found to be peculiar to the offspring of the irradiated females alone. Working in conjunction with Little, Bagg obtained similar results by applying x-rays to pregnant mice, they being able to produce deformities of the legs, feet, head and eyes. Hansen had results similar to Bagg's with radium, when he employed the x-ray upon pregnant rats. Hippel and Pagenstecher treated pregnant dogs with x-rays, obtaining live puppies with cataracts from some litters, but more often fetal death and abortion. The French experimenters, Regaud, Nogier and Lacassagne, caused abortion in dogs by application of x-ray, while from Germany, Cohn, Lengfellner, Krukenberg and Walter likewise reported that the exposure of dogs in whelp to x-ray resulted in the production of deformities of the progeny in utero.

Most of the observations just noted were made a number of years ago, those of Bagg and Hansen being the most recent. The entire subject was reviewed by de Nobele and Lams and presented with an account of their own experiments before the International Radiological Congress which met in London in 1925. They made use of guinea pigs and rats as experimental animals, as Lams has given especial attention to the sexual physiology of the guinea pig, and the same has been done for the rat by the American investigators Long and Evans and the Japanese Ishii. Of the rabbit, the experimental animal most used in France, far less is known, and the transfer of experimental results from animals to human beings is therefore much more difficult. Though they employed x-ray, it is their belief that exposure to radium rays of similar wave length would bring about practically

identical results. In general, the more penetrating the ray, the more pronounced were the results obtained. If irradiation took place soon after conception, the embryo was immediately killed. Later irradiation did not always result in the death of the embryo, though abortion was the most common outcome. Those embryos which survived were abnormal, usually frank monsters. Irradiation late in gestation, when the embryo was near complete development, almost always induced abortion; these results duplicate those obtained by Schinz who worked with rabbits.

In a series of animal experiments to which reference has already been made, Driessen found that rabbit embryos underwent undoubted transformation when the pregnant female was exposed to irradiation. The duration of gestation was prolonged and the resulting offspring, if they survived at all, were distinctly abnormal. By exposing only one side of the animal to the rays, this investigator was able to kill the embryos in the uterine horn of that side, though histologic examination of the uterus itself demonstrated no noticeable changes in the structure of that organ or in the corpora lutea. It is Driessen's opinion that a brief exposure, such as might be employed for diagnostic purposes, would not necessarily injure the fetus in utero, but that caution is necessary not to make exposure unduly long, nor to repeat it, should the first attempt prove unsatisfactory, as repeated exposures apparently produce a cumulative effect which is especially dangerous.

The latest record of animal experimentation along these lines appears to be that of A. S. Parks, reported to the Royal Society last year. His observations were made in the course of an investigation of the causes and physiologic phenomena of menstruation. Irradiation of the female genitalia in both gravid and nongravid animals was one of the features of this study. "The most striking result of the irradiations during early pregnancy" he found to be "that in almost all animals irradiation caused the pregnancy to terminate. The usual course of events was for the estrus to reappear soon after irradiation. . . . These results clearly indicate that the persistent corpus luteum of pregnancy is caused to undergo premature retrogression by exposure of the animals to x-rays. This, however, does not necessarily mean any direct effect of x-radiation upon the organ. The most probable hypothesis is that the fetuses were adversely affected by irradiation, and that their death was followed in the ordinary way by the involution of the corpora lutea."

Nowhere have I found any records of animal experiments where pregnant animals were exposed to radiation without any effect, immediate or remote, upon mother and offspring. This may be simply because no one has been sufficiently interested in combating the prevalent impression that irradiation of the gravid uterus is fraught with grave danger to its content, to collect observations to the contrary. It may also be because no such observations have ever been made. Certainly the general impression gained from perusing the literature of animal experimentation is that injury to the embryo is practically certain to occur.

Turning now to the effects upon the human embryo, we find a rather wider range of observation and, in the case of those who desire to employ the roentgen ray for the diagnosis of pregnancy, a distinct motive for proving that radiation of the pregnant uterus is a safe procedure both for mother and child.

In 1924 we find Reuben Peterson complaining that gynecologists and obstetricians had not promoted the roentgenologic diagnosis of pregnancy because they

"feared to use it in pregnant women on account of its effect upon the fetus." He then assures us that the last question has been answered practically by the results of thousands of diagnostic exposures where no appreciable harm resulted in either mother or fetus, and he goes on to say that it must be borne in mind that there is a vast difference between diagnostic and therapeutic roentgen-ray dosages. Hickey, the head of the radiology department in his university, "has figured that the current for ordinary diagnostic roentgen-ray work is not more than a fiftieth as strong as that used for therapeutic purposes where bad results have been reported, so far as the early embryo is concerned, and he had assured the gynecologist "that there is absolutely no danger to the fetus at any stage of gestation provided the exposures are short and not too frequently repeated."

A consideration of the literature lends support to Peterson's position, which I am assuming to be typical of that of the majority of those members of our profession who have interested themselves in this form of diagnosis. Even if a certain percentage of mothers diagnostically exposed to x-rays later gave birth to malformed or mentally defective children we would have no right to assume that the x-ray had anything to do with this until a careful comparison was made between the percentage of anomaly presented by a large series of x-rayed cases with the percentage of anomaly occurring in births in the general population where no x-ray exposures had been made. No one has attempted to compile these figures so far as I am aware, and we must not forget that mental deficiency, hydramnios, clubfoot and similar malformations and monstrosities, existed before Conrad Roentgen himself was born. We are, I think, justified in dismissing from consideration, the injuries possibly sustained by the fetus subjected to diagnostic x-ray within the uterus.

Several comparatively recent articles have surveyed the literature since 1914 relating to injury of the fetus in utero by the therapeutic application of x-ray, and since 1923 radium radiation has also shared in the responsibility for such injury.

Abels canvassed the subject quite thoroughly, as did also Zappert, their reports covering largely the same ground. Zappert collected twenty-one observations where there was likelihood of the fetus having been injured by x-ray or radium treatment of the mother, and less than half the children born under these circumstances, could by any possibility be rated as normal. Most of them were underweight and presented other indications usually associated with prematurity. In a relatively large number of cases microcephaly was present, and some of these babies had microphthalmia as well. This author calls attention to the rather impressive circumstance that the most carefully and scientifically observed cases always showed graver disturbances of development than did those which were more casually observed and recorded. Driessen's reports of observations on human subjects also coincide with the authors just mentioned. In the United States Mundell of Washington, D. C., reported a case of carcinoma in a pregnant woman treated by radium applications, which was promptly followed by abortion. He collected fourteen cases where radium was used during pregnancy with no appreciable effect upon the fetus, but offset this by a list of fifteen where abortion, fetal anomaly and early death were the outcome. Most of his collected cases were included in the lists of the European writers already mentioned.

Examination of the material thus gathered shows a very striking agreement in all the main contentions. Very early irradiation appears to induce abortion quite regularly when x-ray or radium is therapeutically applied. Later applications of radiation would seem to retard the normal development of the fetus and to induce abnormalities, especially of the eyes and brain. The abnormalities reported are substantially the same in the majority of cases. In that of Ries there were anomalies of the genitourinary apparatus in addition to deficiencies in the skeleton, but, as the author points out, our knowledge of fetal development precludes our attributing the occurrence of these to irradiation of the mother which did not take place until one hundred and twenty-one days after the calculated beginning of pregnancy. Moreover, the mother in this instance was herself defective, a cretin, and as the child was illegitimate, no information about its paternity could be obtained, so that the inference is very strong that radiation was only in small part responsible for the fetal malformations in this case.

A much better illustration is the case of Naujoks, whose patient had given birth to a normal child before she developed sarcoma of the ovary. Following operative removal of this growth she received prophylactic roentgen irradiation and became pregnant either during or soon after this treatment. The second child was apparently born at term but from the first did not appear normal. At one year there was microcephalus and indications of deficient mentality. The mother remained well and bore a third child which was healthy and apparently normal at three months of age. The second child at two years of age, on the contrary, was extremely small and weak, with a head like that of a bird. She was of very irritable temper and had not begun to talk. The author believed her to be idiotic. The difference between the child irradiated in utero and the two others of the same parentage and environment who had not was very striking. Abel's patient had previously had three children. She was irradiated during what proved to be the third month of pregnancy. The author emphasizes the fact that the child was born at full term, as it had fully developed nails, the testicles were descended and lanugo was present. The head, however, was typically microcephalic, and there was also double microcornea and microphthalmus. The penis was less than 5 mm. in length and had no corpus cavernosum. The muscles of the lower extremities were slightly spastic. X-ray examination of the long bones showed alterations which were suggestive of syphilis, but the Wassermann reaction was negative, and there was no history nor other stigmata which would have confirmed this suspicion. None of the mother's previous children had displayed similar manifestations. It is only fair to recognize, however, that the neoplastic disease for which the mother was treated by radiation may not have existed at the time of the previous pregnancies.

According to Bailey and Bagg it is the severity of the treatment, as well as the period of fetal development during which irradiation took place, which determines the particular reaction of the individual fetal tissues. One of their patients had local treatment of the vulva during the fifth month of gestation, which they evidently looked upon as light. At the eighth month the mother was treated over the vulva with gamma-ray radiation, equivalent to 50 per cent of the erythema skin dose. "The treatment was not severe, the fetus was not directly irradiated, the child was apparently normal at birth and has remained so up to the present time." Judging from the clinical reports they have studied, these authors have formed the opinion that in those instances where comparatively great disturbances have resulted in the child, the irradiation was given early in pregnancy. Driessen expresses similar sentiments, the younger the embryo, the greater the injury. While he willingly makes allowance for the possibility that some of the abnormalities appearing were not in any way due to the effects of the roentgen rays, the evidence that the rays

from radium and x-ray do injure growing tissues, including those of the embryo, is too overwhelming to be ignored. Mundell admits that though it may very well be argued that the deformities of the babies born of mothers who had undergone treatment for malignancy or fibroids might be due to the maternal weakness, "the reporters in each instance were of the opinion that the deformity was the result of radiotherapy. Also such malformations have not been noted heretofore in children born of mothers who were suffering with cancer of the cervix, before the advent of radium therapy. Therefore, it would seem safe to say that such conditions are not merely coincidences."

It is my personal belief that the evidence so far collected is overwhelming in its demonstration of the dangers of using x-ray or radium upon a pregnant woman when there is reason to hope the pregnancy can be continued to full term. Every gynecologist should make certain that pregnancy is ruled out before he begins treatment for either benign or malignant conditions of the female generative apparatus. In the rare coincidence of pregnancy and cancer of the cervix, the usual considerations governing the production of abortion will have to be marshalled and debated. In a personal communication from Joseph Muir of New York, he stated emphatically that radium dosage sufficiently high to be effective in controlling cervical cancer would undoubtedly be fatal to the fetus in utero. He added that inasmuch as it is unreasonable to expect a woman suffering from such a malignant disease to be able to carry to term and deliver a normal healthy child, he felt that there was no question of the advisability of immediately emptying the uterus. I am fully in accord with him in this. The question here is not whether the life of the fetus should be sacrificed, but whether therapeutic abortion is, under the circumstances, the course which should be pursued as offering the greatest chance of saving the life of the mother.

As the situation just cited is fortunately rare, the irradiation of women suffering from uterine fibroids or similar benign conditions presents a problem much more likely to be offered to the gynecologist. Confusion between the fibroid and the pregnant uterus has occurred often in the past, and even with the greatest diagnostic care, is almost certain to take place in the future. Again, fibroids and pregnancy may exist together. If a pregnant woman is thus inadvertently radiated, what is the proper course to follow? Should the pregnancy be allowed to continue to term if it will, or should the strong probability of the product of gestation being deformed or otherwise abnormal constitute an indication for its interruption? Some of those who are enthusiastic advocates of the diagnostic use of the x-ray may come forward at this point and suggest that during the later months of such a pregnancy it will be possible to determine by the fluoroscope whether or not the fetus in utero is microcephalic or otherwise malformed. This is, of course, quite possible, but I cannot feel that our problem could be solved so easily. Due care in the selection

of cases subjected to x-ray or radium treatment is our greatest safeguard. Even in elderly women the history should be minutely scrutinized, and the possibility of pregnancy should be kept continually in mind. Only in this way can the gynecologist and radiologist obviate much human suffering and at the same time avoid personal chagrin.

CONCLUSIONS

1. Diagnostic exposure is not harmful unless resorted to too frequently.

2. Therapeutic exposure causes abortion in the early months and various deformities of eyes, brain and cord during the later months.

3. The severity of dosage and the period of fetal development determine the particular reaction of the individual fetal tissues, the younger the embryo the greater the injury.

4. Malignancy superimposed upon pregnancy demands measures sufficient to destroy cancer, the life of the fetus, of course, being disregarded.

5. In obscure cases, pregnancy and fibroids coexisting, and in elderly women, the probability of pregnancy should always be kept in mind in order to avoid subjecting the supposedly absent fetus to immediate death or to something worse.

REFERENCES

- Abels, Hans*: Wien. klin. Wchnschr. 37: 869, 1924. *Bagg, H. J.*: Am. J. Roentgenol. 16: 529, 1926. *Bagg, H. J., and Little, C. C.*: Am. J. Anat. 33: 119, 1924. *Bailey, Harold, and Bagg, H. J.*: AM. J. OBST. & GYNEC. 5: 461, 1923. *de Courmelles, Fouveau*: Paris méd. 2: 142, 1925. *Driessen, L. P.*: Nederl. Maandschr. v. Geneesk. 12: 239, 1924. *Hickey, P. M., and Hall, E. W.*: Am. J. Roentgenol. 18: 458, 1927. *Mundell, J. J.*: AM. J. OBST. & GYNEC. 13: 86, 1927. *Naujoks, H.*: Monatschr. f. Geburtsh. u. Gynäk. 68: 40, 1924. *de Nobele and Lams*: Brit. J. Radiol. 31: 449, 1926. *Parkes, A. S.*: Proc. Roy. Soc. Edinburgh 102: 51, 1927. *Peterson, Reuben*: AM. J. OBST. & GYNEC. 8: 770, 1924. *Ries, E.*: AM. J. OBST. & GYNEC. 11: 361, 1926. *Werner, P.*: Arch. f. Gynäk. 129: 157, 1926. *Zappert, J.*: Wien. klin. Wchnschr. 38: 669, 1925; Arch. f. Kinderh. 80: 34, 1926; Monatschr. f. Kinderh. 24: 490, 1926.

899 MADISON AVENUE.

RADIOTHERAPY IN THE TREATMENT OF CANCER OF THE CERVIX*

WITH COMMENTS ON MODERN VARIATIONS IN ITS APPLICATION

BY WALTER DANNREUTHIER, M.D., F.A.C.S., NEW YORK, N. Y.

(From the Department of Gynecology, New York Post-Graduate Medical School and Hospital)

RADIUM therapy is so well established in North America as the most valuable single therapeutic agent in the treatment of cancer of the cervix that any further statistics or supporting arguments in its favor would be superfluous. My participation in this discussion will therefore be restricted to a few comments on the general practices of the profession, the various ways in which irradiation is utilized, the necessity for accurate diagnosis, the importance of recognizing the contraindications for radiotherapy, and the hazards involved in its use by the inexperienced.

In visiting different clinics, I have been impressed by the diverse designs of radium applicators and the variations in technic. Some operators use one of the salts of radium, others the emanations only. Massive doses are insisted upon in several institutions, while divided doses are believed to be equally efficient in others. Probably most of these differences are relatively unimportant, provided an ample amount of radium is available, the screenage is correct, and all properly selected cases receive full dosage. I must confess, however, that the forcible and wide preliminary dilatation of the cervix with a branched dilator, before the introduction of a bulky applicator, that I observed in one large clinic was a distinct shock. One could almost visualize this squashing trauma disseminating malignant cells throughout the pelvis. I believe that it is highly desirable to use as small and slender an intracervical applicator as possible.

The homogeneous localized cross-firing resulting from intratumoral transfixation with gold or platinum seeds or platinum-iridium needles, inserted in the lesion at equidistant points, constitutes a definite step in advance in cervical cancer therapy. Personally, I have been using transfixation needles in conjunction with intrauterine applications for the past seven years, with markedly better results.

Despite the encouraging statistics from the Radium Institutes in London, Paris, and Stockholm, many Continental gynecologists are still enthusiastic advocates of radical abdominal hysterectomy. Weibel in Vienna, Warnekros in Dresden, Faure in Paris, and Bonney in London have done a tremendous number of these operations, and each

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, as part of the Symposium on Radiotherapy in Pelvic Disorders, Toronto, Canada, September 10-12, 1928.

one claims a primary mortality of less than 8 per cent, with a very satisfactory number of five-year cures. It must be remembered, however, that these men have developed their technic over a period of years, are unusually skillful pelvic surgeons, and probably have had to adapt their needs to their circumstances following the Great War; and most of them admit the value of postoperative radiation. Toth of Budapest is an ardent protagonist of the Schauta vaginal hysterectomy, but he urges the use of postoperative radiation to control the remote lymphatic chains, inaccessible during the course of the operation.

While radical abdominal hysterectomy is thus a competitor of radium treatment, at the present time roentgen-ray therapy is used chiefly to supplement the primary operations or radium applications. That it has a distinct field of usefulness in destroying metastases in the perimetritic structures, no one can deny, but most roentgen-ray therapists now concede the superiority of radium in the attack on the cervical lesion. The technic described by Schmitz,¹ whereby the entire pelvis is cross-fired with x-ray with almost mathematical exactness, is to be strongly recommended.

Preoperative radiation has lost its early prestige, probably because so few radical hysterectomies are done in this country. Some years ago I favored combined radium therapy and operation above all other methods of treatment, and continue to take advantage of it occasionally. In one patient, only thirty-two years old, with a moderately advanced squamous cell cancer, in whom a radium dosage of 4320 mg. hr. had apparently eventuated in complete macroscopic disappearance of the tumor and normal uterine mobility, the extirpated specimen showed a nest of cancer cells 5 mm. in diameter, surrounded by connective tissue and considerable leucocytic and lymphocytic infiltration. This patient was operated upon nearly five years ago, and is still alive, well, and free from evidence of recurrence. I believe that postradiation hysterectomy has a place in the treatment of comparatively young women, whose biopsy specimens show ripe tumors with hornification. If the operation is deferred until at least three weeks after the last radium application, hemorrhage will have ceased, there will have been an opportunity to reinforce the patient's vital resistance, and the hysterectomy need not be so extensive as the classical Wertheim operation. Following this course of procedure, the primary operative mortality is negligible. In general, however, I am in accord with the majority that with few exceptions most cases of cancer of the cervix are best treated with radium, followed by x-ray. At the New York Post-Graduate Hospital, I give all but hopeless patients 4000 to 5500 mg. hr. of radium therapy in divided doses. Immediately thereafter, these patients are referred to the Department of Roentgenology, for high voltage deep x-ray therapy. The director of this depart-

ment calculates the appropriate dose for each patient, and usually makes an application on four successive days, using the lower abdomen twice, the sacral region once, and the perineal region once, as portals of entry. The sole indication for reduction of dosage in irradiation that I have observed has been an abnormal retention of nitrogenous waste products in the blood, or other evidence of markedly impaired metabolism.

Combinations of radium therapy with cauterization, electrocoagulation, etc., are still in the experimental stage, but I think that most of us, having an adequate quantity of radium, regard the advantages of such methods as at least questionable.

The aphorism that intelligent treatment is predicated upon accurate diagnosis is almost bromidic. Yet, a patient with a lesion simulating cervical cancer presented herself four years ago; who had been treated with radium for two years by a specialist in radiotherapy. The reports on repeated biopsy specimens described endocervicitis only, but the physical appearance of the cervix, together with the persistence of spotty bleeding at intervals were evidently regarded as sufficient justification to disregard the laboratory reports. Pathologic examination of the specimen that I removed by panhysterectomy showed the endometrium and tubal mucosa to be a mass of tuberculosis. In another instance, a bride, twenty-five years old, consulted me after one radium treatment at another hospital for "cancer of the cervix," without improvement in the appearance of the local lesion. The Wassermann and Kahn tests were strongly positive and antisyphilitic treatment effected a prompt cure. It should never be forgotten that tuberculous and luetic lesions of the cervix closely resemble carcinoma at times, and suspicion should be aroused in every case in which the biopsy report fails to corroborate the clinical diagnosis. I presume that the desirability and safety of biopsy specimens require no defense before this Association.

The recent enlightening publication of Healy and Cutler,² demonstrating conclusively the pronounced radiosensitiveness of unripe cancers of the cervix, notwithstanding their greater malignant potentialities, as compared with the slowly invading but more highly resistant ripe tumors, explains the sometimes unexpected satisfactory results from radiation in apparently advanced cases.

Although radiotherapy is commonly regarded as unattended by mortality, one of my colleagues and I have each had one patient who died from acute peritonitis, due to a failure to recognize a latent salpingitis at the time of the radium application. I had a second patient who also developed peritonitis but recovered. One cannot be too careful in excluding purulent accumulations in the pelvis before applying radium or x-ray. If their presence is discovered or even suspected, it is prudent to operate first. The hopelessly advanced cancer in the

patient approaching her end is also a contraindication for intensive irradiation, although a moderate dose of radium will often serve to arrest bleeding and control the malodorous discharge.

A protest should be registered against the indiscriminate and unrestricted distribution of active applicators by commercial organizations to all physicians who are willing to experiment with radium therapy on patients who are capable of paying the fees demanded by these companies. I have seen several patients who have been deprived of whatever chance of cure they once had, or whose bladder or rectum have been irreparably damaged, by underdosage, faulty application, or improper filtration. No one should essay the treatment of a patient with cancer of the cervix unless he has at least 125 mg. of radium, properly screened, in applicators adapted to the cervix and uterine cavity, with a mental picture of the pelvic pathology, a knowledge of the physics of radium, a clear conception of the histopathologic changes which follow irradiation, and a certain amount of experience.

Finally, I would venture the assertion that the details of the treatment of each individual case of cervical carcinoma should be directed by a physician who is a competent pelvic surgeon and who has both an adequate supply of radium and ample roentgen-ray facilities at his command. Only under such circumstances will his advice be unbiased.

CONCLUSIONS

1. Radium is the most efficient single therapeutic agent in the treatment of cancer of the cervix.

2. Variations in technic are relatively unimportant, provided an ample amount of radium is used, screenage is correct, and sufficient dosage is given.

3. Slender intrauterine applicators and intratumoral transfixion with needles are conducive to good results.

4. The sustained popularity of radical hysterectomy abroad is probably due to the concentration of radium in a few institutions.

5. Combined radium therapy and operative treatment is of value in occasional selected cases.

6. Roentgen-ray therapy should be used chiefly to supplement a primary operation or treatment with radium.

7. The appearance of some tuberculous and luetic lesions of the cervix simulates carcinoma.

8. Patients with metabolic impairment, pelvic suppuration, or hopelessly advanced cancer are not candidates for intensive radiation.

9. The indiscriminate distribution of radium apparatus to the profession in general is to be deplored.

REFERENCES

- (1) *Schmitz, Henry*: AM. J. OBST. & GYNEC. 9: 644, May, 1925. (2) *Healy, W. P., and Cutler, Max*: AM. J. OBST. & GYNEC. 16: 15, July, 1928.
580 PARK AVENUE.

PYOMETRA FOLLOWING RADIUM THERAPY FOR UTERINE CANCER*

BY P. BROOKE BLAND, M.D., PHILADELPHIA, PA.

CERVICAL atresia with retention of infected material within the uterine cavity, customarily called pyometra, has generally been regarded as an entity of rather infrequent occurrence. Compared with other lesions of the uterus it may still be included in the category of rare conditions, although I believe the incidence of the malady has expanded considerably during the past decade. Since the advent of radium as the preferential recourse in the treatment of cervical carcinoma, pyometra is being encountered with increasing frequency. Prior to the adoption of gynecologic radiology, the disorder was rarely seen, even by the pelvic surgeon of wide experience. This is in sharp contrast with the experience of those in active work today, for in a large number of communications received from my contemporaries in all parts of the country, all except one report cases arising in their practice, ranging from one to ten.

This material was gathered, I might add, in spite of the fact that my letters of inquiry received the rather characteristic indifference usually accorded the questionnaire.

The information submitted, however, indicates that pyometra may be looked upon as a comparatively new entity, at least from the standpoint of the clinician, because it is altogether likely that the large proportion of cases observed arose during the last ten and probably for the most during the last five years.

Even with the increase in the number of cases encountered, this form of pyometra, according to Lammers, of the Radiotherapeutic Institute of Rotterdam, seems as yet generally unknown. Since the complication is gradually becoming more prevalent, perhaps it should not be placed in a nomenclature relating to it alone. I can readily perceive that it probably would be objectional, if not unscientific, to apply the term radium or postirradiation pyometra, though it is clear today that of the numerous etiologic factors, radium is the most conspicuous.

I recall two cases only that can be attributed to causes other than the element named. One resulted from carcinoma of the cervix, the most common cause of pyometra prior to the employment of radium therapy, and the other occurred, as nearly all noncancerous cases do, in an elderly woman with senile fibrosis of the cervix.

It may be of interest to mention that in nearly all countries except

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

America, the condition, owing to its increasing frequency, has aroused considerable clinical interest. Here the etiologic relationship of gynecologic radiology to pyometra seemingly has not been recognized or appreciated, for in a careful perusal of the current literature of America, I was unable to find a single reference to the trouble. The British, Dutch, Swedish and especially the French literature contains numerous case reports and rather lengthy articles dealing with the subject. The condition has, however, aroused more interest in France than elsewhere and, hence, most of the articles describing postirradiation pyometra are found in the French publications.

Even with these references the malady has not been accorded the attention it deserves. That the entity thus far has received only the most meager publicity is probably accountable for the fact that it is more or less new, not suspected and, hence, not generally recognized.

ETIOLOGY

At the outset one must insist on the term pyometra and not establish confusion with uterine cancer accompanied by more or less purulent discharge. The characteristic of pyometra is distention of the uterus with pus. This is the analogy in the uterus of pyonephrosis in the kidney, where the dominant character is not the suppuration but retention with distention of the organ.

It is, of course, obvious that the accumulation within and distention of the uterine cavity with suppurative material may result from any condition producing a partial or complete obstruction of the cervical canal. The causes, therefore, may be manifold. Cases are recorded as resulting from inflammatory edema about the internal os and senile fibrosis of the cervix, as occurs in women advanced in years, is sometimes influential. Endometrial vegetations or polyps springing from the region of the isthmus and occluding the internal orifice of the cervical canal are mentioned as causative as well as malpositions of the uterine body.

Benign neoplasms, in the form of myomas plugging the cervix, have been accountable and cases have resulted from chemical ulceration followed by fibrosis.

Congenital gynatresia may be responsible, but a lesion of this type is almost invariably associated with hemato- and not pyometra.

Heretofore occlusion from carcinoma of the cervix has been designated as the most common cause.

Statistics regarding pyometra, however, as a complication of cervical cancer are far from uniform, ranging from 3 to over 10 per cent. Alamanni, from a study of his personal cases, believes that 3.3 per cent of cervical cancers are associated with stenosis of the cervix, with pyometra as a sequel. Lomon quotes figures of a like percentage. Sainclair sets the percentage as high as 6.2 and Tate as high as 10.7

per cent. These figures are somewhat antiquated, and I believe were drawn from conclusions founded on data more or less in error, probably from regarding cases of advanced cervical carcinoma with malodorous discharge as pyometras.

From a fairly large experience with uterine cancer, extending over a period of several years, I feel reasonably certain that the percentages quoted, especially the higher figures, by the authors named, are far too high.

Personally I do not believe that pyometra complicating cancer of the cervix goes beyond, if it really reaches, one-half of one per cent.

Radium as the accepted mode of treatment of cervical carcinoma has materially increased the incidence of the complication, though to what extent, owing to the scant information now available, is impossible to say.

From a study of my personal cases of cervical cancer treated with radium, I found that approximately one out of every 100 developed pyometra. It is not unlikely that the study of a large series of cases will disclose figures somewhat in excess of one per cent for the complete and considerably more, probably 3 to 5 per cent, for the incomplete type.

Norris, in 600 cases of carcinoma of the cervix exposed to radiotherapy, reports 5 cases of pyometra. Kelly has treated more than 1900 uterine cancers with radium and has observed several cases of pyometra subsequently, though the exact number is not known. Polak reports 7 cases of pyometra following irradiation of the cancerous cervix.

It will not be possible, however, to even estimate roughly the incidence of postirradiation pyometra until an opportunity is afforded to systematically study a large series of cases, or in other words, until the gynecologic radiologist uniformly reports his observations regarding the complication.

I am persuaded that the malady, especially the incomplete variety, is much more frequent than hitherto suspected. The frequent complaint of patients suffering with odorous discharge extending over a period of several weeks or months after the application of radium, has led me to speculate as to whether partial stenosis of the cervix is not responsible in a certain number of cases.

Is it not possible that some of these patients are victims of partial cervical stenosis with intermittent pyometra? These cases are by no means rare and I am inclined to believe that partial occlusion of the cervix with retention of infected material within the uterine cavity is the factor chiefly responsible for the symptom. .

TYPES

From what has already been said regarding discharge and other features of the trouble, it is discerned that cervical atresia is sometimes

incomplete. With the canal occluded completely, it is obvious that all of the infected material would be imprisoned within the uterine cavity. One may legitimately divide, therefore, postirradiation pyometra into two types, (a) incomplete, and (b) complete.

At the outset I am quite confident in stating that the incomplete form is by far the most frequent, though the second variety is by no means rare.

In the partial type the chief symptom, as I shall mention later, is a purulent, offensive discharge. Occasionally it contains blood, though this is not, as in cancer, present invariably. Lomon and others state that in the large proportion of cases it is entirely absent. In the second or complete form all the infected material is retained within the uterus and the principal symptoms are at first wholly subjective.

ORIGIN

With respect to the mode of origin or development of postirradiation pyometra, it is necessary to recall the effect of radium on neoplastic tissue in general, converting it into dense fibrous material.

The typical picture of the cartilaginous or frozen cervix, postirradiated cancerous cervix, needs no discussion. The formation is due fundamentally to fibrosis, followed by contraction and cohesion or fusion of the cervical walls.

The fluid accumulation results from associated inflammatory changes in the endo- and myometrium, lesions almost invariable accompaniments of cervical carcinoma. That the fluid is inflammatory in origin is based on the observation that the normal secretion of the endometrium is almost nil. According to Lomon, it is insufficient to create, even in cases of atresia of the cervix, an appreciable collection.

With respect to infection, one may say that a cancerous area is literally blistering with all forms of pathogenic bacteria and, hence, the accumulating fluid becomes infected from a cavity already teeming with infectious organisms.

ONSET

The onset of the condition and its progress of development are variable. With the influence of radium on tissue reaching its acme in the course of from four to six weeks, it would seem that in an additional number of weeks or approximately three months, fibrosis would be more or less complete. Following this stage contraction must inevitably ensue, but the phenomena that determine why in some instances the fibrosis terminates in stenosis, incomplete or complete, are not understood.

In a small number of cases the pyometra, owing probably to a cervical canal already partially barricaded with carcinoma, develops within a few weeks after the application of radium.

Gellhorn refers to a case of inoperable carcinoma of the cervix which he "needled." Three weeks after the application an acute pyometra developed. This increased with extraordinary rapidity and extended nearly to the umbilicus. He attempted to open and drain the uterine cavity through the cervix, but was prevented by the densely organized mass of scar tissue.

It might be interesting as well as profitable to mention parenthetically that this patient, though intensely ill, was given milk hypodermically and after twelve injections the uterus was practically of normal size. Gellhorn reports a similar experience with another patient.

However, rapid development is not the rule and I believe that more than 75 per cent of the cases are of a semichronic type, developing slowly and not giving rise to symptoms before three or six months.

Polak's cases arose within three and all of Norris's within six months. Spalding observed one case in a patient four weeks after irradiation and in another seven months following treatment. Sireday and Gagey, in discussing this feature of the trouble, report one case of pyometra arising two years after the application of radium.

In a small number of instances the process of development is extremely tardy and symptoms may not arise for a year or more. In three personal cases subjective symptoms, expressed in pelvic discomfort finally amounting to severe pain together with tenderness and uterine enlargement, arose in two patients at the end of two years and in the third at the end of seven years. In the first two patients the symptoms at the beginning were not severe, and they did not apply for relief until three years elapsed from the date of treatment. The third patient did not consult me until one year after her symptoms began or nearly eight years after the application of radium.

SYMPTOMS

In considering the symptomatology of postirradiation pyometra it becomes necessary, first, to describe the clinical phenomena associated with the partial or incomplete type and, second, those accompanying the closed or complete variety. The former is subjectively manifested by periodic attacks of mild pelvic pain, due to efforts of the uterus to expel the retained material, and an offensive purulent discharge. At times the discharge is tinted with blood, *though this is not constant, differing in that respect from the discharge accompanying uterine carcinoma.* After the expulsion of the collection, mechanically comparable to a miniature labor, the pain temporarily subsides.

In the closed type of pyometra the predominant subjective symptom is hypogastric pain, though this may not become manifest until the pyometra attains considerable dimensions. In the acutely septic cases the symptoms are correspondingly acute, evincing systemically phenomena of a septicemic process, combined with those localized in the pelvis and already enumerated.

With reference to the pelvic distress one may say that pyometrial pain occasionally is extremely severe, sometimes radiating to the loins, the entire abdomen and even to the back.

It should be remembered that the distress ceases after spontaneous evacuation of the accumulated material, to reappear at regular or irregular intervals with the reformation of the pyometra. It seems that the pathogenesis of the pain is quite comparable to colic or "uterine tenesmus" which sometimes, according to Doleris, accompanies "chronic inflammation of the uterus with insufficient drainage." It is important to distinguish the discomfort associated with pyometra from that provoked by cancer itself. This should not be difficult if one recollects the periodic or labor-like phase of the pain provoked by pyometra.

DIAGNOSIS

With regard to diagnosis it may be said that the clinical history alone should lead one to suspect pyometra in patients previously exposed to cervical irradiation who subsequently complain of a purulent discharge, *a discharge not constantly blood tinted*, especially if associated with intermittent attacks of mid-pelvic pain. The expulsion of a large quantity of suppurative material followed by temporary cessation of pain is a symptom of the utmost diagnostic significance. Diminution of the discharge followed by recurrence of the pain, in other words a symptom complex signaling a reaccumulation, is still more important.

Exploration of the interior of the uterus with a dilator discloses the cavity increased in depth. This procedure usually is associated with or followed by the escape of purulent fluid and temporary alleviation of the discomfort.

In the concealed or complete variety one should seriously think of postirradiation pyometra in patients treated with radium months or years previously who complain of hypogastric distress of increasing intensity, finally culminating in intolerable pain.

With the highly suggestive clinical history and the subjective symptoms named, confirmation is found, first, in a renitent or semielastic tumor projecting above the symphysis and, second, by finding, on vaginal examination, a withered fibroid cervix with an impermeable canal.

The size of the uterine distention is variable, depending on the duration of the obstruction. In two cases I observed, the enlargement corresponded to a three months' gestation and in another case, one of eight years standing, the fundus was slightly below the umbilicus or about the area reached at the fifth month of pregnancy.

With the rather characteristic clinical history portrayed by radium pyometra one should be able to establish a diagnosis with comparative facility, though from a study of the case records thus far published,

as well as from my personal experience with the trouble, I am inclined to believe that only in a small proportion of cases is a preoperative diagnosis made.

In some instances the tumor prior to operation has been looked upon as a myoma and in others as an ovarian cystoma. Only after exposure of the distention through an abdominal incision has the actual nature of the enlargement been recognized.

In one of my cases, owing to the globular contour and semifluctuant state of the tumor combined with an abrupt onset of the pain, I made the erroneous diagnosis of an ovarian cyst with a twisted pedicle. Not until I freely exposed the enlargement through a mid-line incision was the true nature of the condition disclosed. In another case of the complete type a provisional diagnosis of a uterine myoma was made. Disregard of the rather characteristic signs associated with the condition, namely, (a) rapid development covering a period of two years, (b) absence of discharge, (c) inordinate pain, (d) withered impermeable cervix, all diagnostic signs arising in a patient beyond the menopause, led to the error. To recall this rather typical diagnostic silhouette should direct one in paths leading to a correct diagnosis in most cases.

PROGNOSIS

In considering the prognosis one may say that, provided the cancerous state of the cervix is completely eradicated, the ultimate outcome is favorable. In the incomplete type catheterization of the uterus with or without lavage usually relieves the condition. In the complete type, if catheterization is impossible, hysterectomy is indicated. Early recognition of the disorder is of considerable prognostic value, because failure to establish a diagnosis promptly may lead to danger in two respects:

First, by assuming recurrence of the cervical carcinoma, there is danger that the surgeon will make the mistake of administering a new series of radium treatments, a measure which would certainly lead to still more serious consequences.

The second danger lies in the possibility of prolonging the period of complacency or watchful waiting until the retained fluid under high pressure spontaneously rends asunder the uterine wall. This is entirely within the realm of possibility, woefully confirmed in a patient observed in my practice.

This patient was given a 1000 mg. hr. dose of radium for chronic metropathy with menorrhagia. Subsequently she developed a purulent discharge of a gangrenous type. Ultimately this subsided, but cessation was followed by increasing pelvic pain. Three months later I saw this patient in consultation with the family physician and found her suffering with generalized peritonitis.

Twenty-four hours before she was suddenly seized with violent pelvic pain followed by symptoms of widespread peritoneal infection. She was admitted to

the hospital in a most perilous condition and succumbed before any measure could be instituted with the hope of affording relief. Lomon refers to two somewhat similar cases with a fatal termination in each.

TREATMENT

With regard to the treatment of postirradiation pyometra there is not much to say. The subject has already been indirectly referred to in discussing the prognosis.

In all the incomplete cases thus far recorded dilatation or catheterization of the uterine cavity has been sufficient to effect a cure. In other words the establishment of free uterine drainage.

With a cervix absolutely stenotic, the only effective mode of treatment is hysterectomy, a procedure rendered necessary in three of my cases.

The rather characteristic clinical features of postirradiation pyometra are illustrated by the following case reports:

CASE 1.—Mrs. E. J. S., aged fifty-two years. On March 7, 1924, the patient was given a 2400 mg. hr. dose of radium for advanced cervical carcinoma. On April 6, 1927, she again came under observation complaining of severe pain in the hypogastrium and back. This had been present for a period of three months. The patient was examined bimanually and a diagnosis of a uterine myoma was made.

After opening the abdomen, the uterus was grasped with a Vulsellum. This maneuver was followed by rupture of the organ and the escape of a large quantity of pus. Fortunately the operative field was effectively isolated by a gauze cofferdam and no untoward trouble developed.

CASE 2.—Mrs. W. L., aged fifty-six years. This patient, suffering with a uterine myoma accompanied by menorrhagia, was given a 2400 mg. hr. dose of radium on August 10, 1922. On September 21, 1925, she was admitted to Jefferson Medical College Hospital complaining of vague abdominal pain and a blood tinted purulent discharge.

On bimanual examination the uterus was found uniformly enlarged with the fundus projecting above the symphysis. A diagnosis of a myoma was made and accordingly a hysterectomy was performed. The uterus, on subsequent examination, was found to be a large pyometra. A moderately early endometrial carcinoma was discovered springing from the right fundal wall. This imparted to the discharge the significant blood tinted hue.

CASE 3.—Mrs. F. K. K., aged seventy-four years, was seen by another surgeon in July, 1917. A diagnosis of inoperable carcinoma of the cervix was made. No treatment was advised or instituted at this time.

I saw the patient first on January 28, 1918. She was given two 2400 mg. hr. doses of radium and remained well until May, 1927. On June 22, 1927, she was readmitted to the hospital complaining of pain in the lower abdomen, especially in the right side.

On vaginal examination there was found no evidence of recurrent disease, but abdominally a large semi-elastic tumor with its summit approaching the umbilicus was noted. This was somewhat tender, though moderately movable. A tentative diagnosis of an ovarian cystoma with partial torsion of the pedicle was made.

Accordingly an abdominal operation was advised and performed. On exposing the pelvic contents the precise character of the enlargement was revealed and the pyometrous uterus containing more than a liter of foul fluid was removed.

Finally, may I entertain the hope that this paper, though somewhat diagrammatic and brief, may be the medium of stimulating special interest in the subject on the part of the gynecologic radiologist.

REFERENCES

- (1) *Alamant, R.*: Riv. d'obst. e ginec. Prat. Oct. 29, 1922. (2) *Condamin, R.*: Lyon med. 134: 753-56, 1924. (3) *Gellhorn, George*: Personal Communication. (4) *Kelly, Howard A.*: Personal Communication. (5) *Lammers, H.*: Nederl. Tijdschr. v. Geneesk., Harlem 1: 278-81, 1923. (6) *Lomon, A.*: Gaz. de gynec., Par. 27: 225-33, 1912. (7) *Norris, Charles C.*: Personal Communication. (8) *Polak, John O.*: Personal Communication. (9) *Roberts, C. H.*: Proc. Roy. Soc., Lond. 8: 1914-15. (10) *Sireday and Gagey*: Le radium en gynecologie, Paris 115, 1922. (11) *Spalding, Alfred B.*: Personal Communication. (12) *Violet*: Lyon med. 139: 694-96, 1927.

HYPERTHYROIDISM COMPLICATING PREGNANCY²

BY FREDERICK HOWARD FALLS, M.S., M.D., CHICAGO, ILL.

(From the Department of Obstetrics and Gynecology, College of Medicine,
University of Illinois)

THE control of the function of reproduction is, like that of digestion, practically entirely under the control of the vegetative nervous system. The uterus, tubes and ovaries are all richly supplied by the sympathetic ganglia of the pelvis and will function entirely independently of the central nervous system. These functions are apparently further governed in part by the action of certain hormones or secretions of the ductless glands acting directly or indirectly through stimulation of the sympathetic nervous system.

It is not surprising, therefore, that contemplating the physiologic and pathologic changes that occur during pregnancy in the human body, deviations from the normal nonpregnant state can be found in the various ductless glands as an expression of their response to the abnormal stimulus brought about by the pregnant state. Thus it is seen that the anterior lobe of the hypophysis may be greatly enlarged, even to twice its normal size,¹ due to overgrowth of the chief cells which dominate the eosinophilic and basophilic cells forming about 80 per cent of the total cells. The adrenals² are less changed grossly, but there is evidence that the cortical portion is markedly increased in size and that the activity of the medullary portion is also increased. The ovary presents the unusual corpus luteum of pregnancy, and the graafian follicles fail to develop during this period. Other less evident functional changes in the interstitial cells may well be present. In addition there is evidence that the thymus, epiphysis, parathyroids, and Langerhans' islands of the pancreas are also functionally altered by the pregnant state.

²Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

The thyroid is one of the most noticeably altered of the endocrines during pregnancy. In a large percentage of cases this enlargement can be appreciated clinically, and in some cases there appears first during pregnancy a true adenomatous growth, with symptoms of a toxic adenoma. The pathologic and clinical picture of a true exophthalmic goiter may supervene.

In reviewing the literature one is struck by the fact that no one man has had a wide experience in this type of obstetric complication, and this is one important reason for bringing the subject before this association so that a free discussion will stimulate interest in the subject and add to our information.

I wish to approach the subject from two points of view, namely, from that of the surgeon and from that of the obstetrician. The material which I have collected lends itself well to this grouping of the cases. My own material which was collected at the Research Hospital, University of Illinois, was under my supervision throughout. The other cases have been furnished by my surgical colleagues, Drs. Percy and Nadeau of the Augustana Hospital and Dr. Seed of the Surgical Department, Research Hospital, of Chicago. The pregnant woman who develops symptoms of thyrotoxicosis either may consult a surgeon primarily, whether or not she knows she is pregnant, or she may be sent to a surgeon for treatment by her obstetrician. In either event the determination of the line of treatment is left to the surgeon. Quite naturally his chief interest is in the goiter and its manifestations. Under the circumstances it is logical that he concentrate attention on the management of the goiter problem and that to a greater or lesser extent he disregard the existence of the pregnancy. On the other hand to the obstetrician the goiter and its symptoms are only one phase of the pregnancy, and the latter assumes the major importance. As a result two lines of treatment have been evolved based on these two views. In a given case of thyrotoxicosis, especially the exophthalmic type of goiter, the surgeon may advise that the patient be treated medically with Lugol's solution at bed rest for a period of one or two weeks until the clinical picture improves and the basal metabolic rate drops. He will then advise partial thyroidectomy or ligation of one or both poles to decrease the thyroid symptoms. If in accomplishing this very important desideratum the patient aborts, he regrets the incident but nevertheless feels that this is the wisest course to pursue. He feels that there may result even under the best of medical management a thyrotoxicosis which in itself will produce abortion and may result in the death of the mother whether or not she is operated.

The medical man and obstetricians on the other hand are apt to proceed as follows: The patient is put to bed and on Lugol's solution ten drops three times a day. The basal metabolic rate is carefully determined, and the progress of the case is watched under this management.

If improvement is continuous, they are prone to advise against operation, at least until the viability of the child, at which time the baby is relatively safe even though the mother's condition be somewhat jeopardized by the increased strain of labor. This they advise even if operation has eventually to be resorted to. It was to gain some first-hand information on the correctness of these views that this work was undertaken.

In addition to this we have sought some information concerning a group of pregnant patients who display many evidences of hyperthyroidism without falling into the class of true toxic goiter. It has been our impression for many years that a large number of pregnant women who show some increased nervous instability, have a slightly enlarged thyroid and a fine tremor, were in reality affected by a mild hyperthyroidism. These signs and symptoms we have been prone to regard as neurosis or simply as part of the changes incident to pregnancy without attempting to determine what those changes were fundamentally based upon.

The clinical manifestations of this altered function of the thyroid gland during pregnancy vary greatly in the individual case and to some extent with the type of pathology presenting in the thyroid gland itself.

Group I.—The mildest symptoms noted have been increased nervousness, slight weakness, tremor, tachycardia, sweating and a slight increase of the basal metabolic rate. These women are not seriously affected by the altered secretion of the gland, but neither can the abnormal symptoms they present be totally disregarded nor put down as in the textbooks simply as signs of pregnancy.

Group II.—A second group shows symptoms of a toxic adenoma. The gland is irregularly enlarged. There may be difficulty with respiration and phonation, marked prostration and weakness may be seen. The gland may feel nodular, and the basal metabolic rate is usually markedly increased. The giving of Lugol's solution may distinctly aggravate the symptoms. Tremor, tachycardia and sweating may be marked.

Group III.—The third group comprises those patients with typical exophthalmic goiter symptoms. These patients have a firm, moderately enlarged gland, and usually the enlargement is diffuse. They have, as a rule, marked tremor and tachycardia. Gastrointestinal symptoms are common, such as nausea, vomiting and diarrhea. Loss of weight may be marked, and the basal metabolic rate may rise to plus 100 or more. Iodine in the form of Lugol's solution is beneficial, at least for a time, and the remission of symptoms following its exhibition is a significant diagnostic point. Occasionally symptoms of exophthalmic goiter appear for the first time during pregnancy. In other cases a mild hyperthyroidism is distinctly aggravated by pregnancy. In still

other individuals a distinct hyperthyroidism is ameliorated by the pregnant state, and a relapse follows the termination of pregnancy.

C. P. Howard³ quotes Charcot and Dock to the effect that "Symptoms of exophthalmic goiter begin during pregnancy or the puerperium in some cases while others improve during pregnancy and do not afterwards relapse."

Maurice Fabre reports a case which developed exophthalmic goiter in October, 1924. Patient had tremor, exophthalmos and a small goiter. The Goetsch test was positive. She was treated by doses of hematoethyroidin. She became rapidly better and was better for four months when a severe recurrence occurred following the death of her six-year-old son. She again became better using hematoethyroidin. A pregnancy started the next month. All treatment was stopped, and in spite of the fact that he expected a recrudescence during pregnancy he found the patient in excellent condition, no tachycardia or tremor, perfect morale, and she assured him that she felt better than she had for a year. Pregnancy, parturition and puerperium were uneventful. The baby was perfectly normal. She nursed the baby, and since delivery her condition has remained satisfactory.

The intimate relationship between the thyroid and the pelvic organs is stressed by Miles F. Porter⁵ who reports a case of hyperemesis cured by thyroidectomy. In certain invertebrates the thyroid is a sexual organ and empties through a duct into the genital tract. The thyroid is relatively larger in women than in men. Women are five times more prone to thyroid disease than are men, according to this writer.

Stowe⁶ reports a case which developed an acute exophthalmic goiter secondary to tuberculosis of the pelvic organs; patient died during labor.

Goodell and Conn⁷ report a case in which a goiter was produced by pelvic tuberculosis and cured by panhysterectomy.

Mussey⁸ and his associates found among five thousand and forty-three women with exophthalmic goiters thirty-two who were pregnant. Some of these stated that pregnancy improved their goiter symptoms, while others said it made them worse. Only two developed exophthalmic goiter symptoms during pregnancy. These were both mistaken at first for hyperemesis cases because of the goiter crisis symptoms. None of the mothers died while at the Mayo Clinic, although one is reported to have died during childbirth after leaving Rochester, probably of causes other than exophthalmic goiter. Two abortions and two premature deliveries at six months with two full-term still births give a total fetal mortality of about twenty per cent. They found that the use of iodine solution reduced the necessity for primary ligation of the arteries.

Ten patients with toxic adenomata became pregnant after the hyperthyroid symptoms developed. All the mothers delivered living babies safely except one who had a dead baby due to dystocia. All but one had some operative treatment. The exception delivered normally spontaneously.

Mussey warns against the indiscriminate use of iodine preparations and thyroid extract in pregnant women who have symptoms of hyperthyroidism and especially if these are associated with clinical manifestations of toxic adenoma.

Davis⁹ studied the basal metabolism rate in a series of pregnant women to whom he was giving iodine on the strength of Marine's findings of decreased iodine content of the thyroid during pregnancy. He reports observations on thirty-six cases. In nine cases of normal thyroid and normal symptoms he found a basal metabolic rate of plus 2.9 before delivery and plus 4.5 after delivery. In seven cases of hypertrophied thyroid and no symptoms and normal pregnancy he found a basal rate before delivery of plus 22.1 and within eleven days postpartum a rate of plus 3.1. He noted an average normal or slightly subnormal rate in five cases of pregnancy toxemia. Two cases of toxic adenoma were studied. One improved

and went to spontaneous delivery at term after lobectomy, done at the fourth month of pregnancy. The second was carried through under medical management, delivered a normal baby and had a subtotal thyroidectomy twenty days postpartum. One patient with severe hyperemesis gravidarum and symptoms of thyrotoxicosis responded nicely to iodine therapy.

An analysis of the basal metabolic rates in a series of normally pregnant women and in those showing the clinical manifestations of thyrotoxicosis, has disclosed the fact that the laboratory test has backed up the clinical impression in practically all cases. It was found that in those cases showing severe symptoms of hyperthyroidism the basal metabolic rate was as a rule correspondingly higher than in those showing mild or no clinical evidence of the thyroid overactivity.

In those patients showing toxic symptoms of an exophthalmic goiter type the use of Lugol's solution in ten drop doses three times a day caused a marked improvement, and the same observation has been made by Mussey, Davis, and others. We have also noted an acute intoxication following the giving of small doses of Lugol's solution to patients with adenomatous types of goiter. Those patients falling in Group I, I described above, had no iodine. This was omitted so that the clinical picture and basal metabolic rate would not be altered thereby. In Group III there are three cases who were referred to the clinic as hyperemesis gravidarum cases which were found to have acute exophthalmic goiter with severe gastrointestinal symptoms. Davis⁹ and Dr. Carl Harper report a similar case, and it is probable that they are much more common than we are accustomed to suppose.

I wish to report in some detail one of these cases partly because it illustrates the condition just mentioned and partly because it represents the most carefully observed case that we have studied.

The patient entered the obstetric department of the University of Illinois, Sept. 15, 1927. She was a colored primipara, thirty years old, married and a factory worker. From her features and color one would say that she was not of pure Ethiopian stock. Her last regular menstruation was April 13, 1927, but she flowed for three days beginning May 10, 1927. The latter part of June she began to vomit, at first only once a day, later progressively more frequently. She had to stop work July 11 because of weakness. About Aug. 1 she became extremely nervous and developed a marked tremor. For a month before entry she vomited day and night. Food stimulated vomiting, and it was frequently preceded by hiccup. Her family history and past medical and surgical history were essentially negative. Her menses began at eleven, were regular, thirty-day type and lasted five days with the passage of some clots. Physical examination revealed a poorly nourished woman whose present weight of one hundred seven pounds contrasted with her normal weight of one hundred forty-six pounds. Her pulse was 140, respirations 32, and temperature 98.6. Her systolic blood pressure was 108, diastolic 52. The positive points in the physical examination were: Neck showed moderate enlargement of the thyroid which was firm and not nodular, and the pulsations of the vessels of the neck were marked. There was a moderate degree of exophthalmos. Her chest showed decreased expansion, respirations were shallow and rapid, breasts were small and firm. The lungs were negative for rales.

Whispered and spoken voice faint. The heart's action was rapid. The apex impulse was not strong with a slight suggestion of a thrill. There was a systolic murmur which was transmitted to the axilla. The uterus was enlarged to about the size of a six months' pregnancy. Reflexes were slightly exaggerated. Vaginal examination revealed no abnormalities. The patient appeared to be extremely toxic and exhausted and was hardly able to stand. The basal rate two days after admission was plus 49. She was seen in consultation by Dr. Seed of the Surgical Department who advised Lugol's solution ten drops three times a day and was in favor of a thyroidectomy as soon as the crisis symptoms subsided. He feared that improvement, if it occurred, would only be temporary and that operation should be done before a relapse occurred. We pointed out the danger of abortion which he admitted but felt it was slight in comparison to that of another thyroid crisis. *The vomiting stopped promptly on bed rest and Lugol's solution, and the basal rate remained above normal though greatly reduced.* She continued on Lugol's solution from Sept. 19, until Nov. 4, and after a rest of a few days it was commenced again and was again discontinued on Dec. 19 for five days. It was then continued until her delivery. An x-ray taken of her chest was negative for tuberculosis. A film made on Sept. 16, 1927, showed a single fetus; a similar

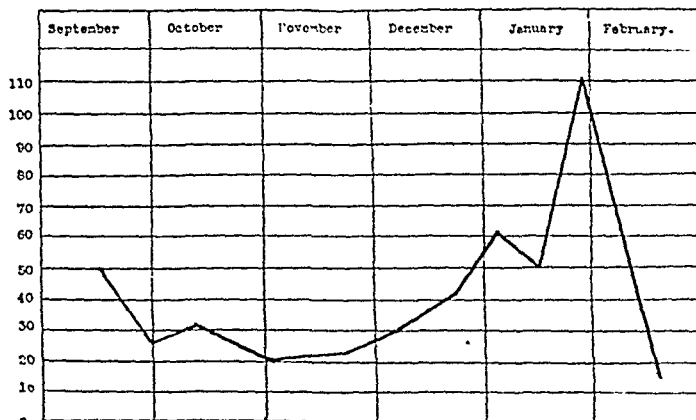


Chart I.

one taken Jan. 3, 1928, showed two babies. Chart I shows the changes of the basal metabolic rate. The red blood count was 4,650,000, leucocytes 13,600. Her general condition was so good on conservative management that we decided to defer operation until some further evidence of thyroid toxemia manifested itself. We found that the basal rate stayed only slightly above normal, that the pregnancy apparently developed normally and that the patient's general condition and nutrition continually improved. She had very little reserve strength, however, as evidenced by her weakness in attempting to get out of bed on several occasions. The iodine solution was stopped twice for a period of a few days, and this was followed each time by an aggravation of the nervous symptoms, although the vomiting did not return. We kept her under this management and in bed most of the time until February. A rather marked hydramnios developed about Jan. 15, and an x-ray picture was taken because of the possibility of a monstrosity. This picture showed two normal twin babies, presenting by the breech. Toward term she was allowed to get up for two days but seemed too weak to support much activity. A bag induction was done at term because she did not go into labor and was quite uncomfortable from the hydramnios. The duration of labor which was normal in every way was about eight hours. As soon as the first stage was completed both babies were delivered by breech extraction on February 4, 1928.

This case illustrates the onset of a thyrotoxicosis in a patient who previously had no symptoms of thyroid hyperfunction. It demonstrates the fact that medical management will control certain of these cases, that it is not necessary to terminate the pregnancy if the patient can be kept in bed, and also that Lugol's solution can be used over a period of several months without causing intoxication. This patient while in the hospital was in a rather crowded colored ward with general nursing care, conditions which are not altogether ideal.

One of the babies died shortly after birth due to small cerebral hemorrhages. The other survived, gained normally and had no evidence of goiter and has since developed into a normally healthy child. This is in contrast to the findings of Carlson,¹⁰ who noted distinct evidence of hyperthyroidism in pups and kittens from goiter-bearing mothers.

We wish to record our findings in cases under the above groupings. A review of the data shown in Table I, mild hyperthyroidism, reveals in these cases in general that hyperthyroidism of this degree affects pregnancy very little or not at all. Most of the gestations went close to the estimated term except Case 8, a hydorrhea gravidarum, and Case 4, a pre-eclamptic toxemia. The babies were all well developed and showed no evidence of thyrotoxicosis. Labor was not complicated. We noted concomitant symptoms of eclamptogenic toxemia in four of the thirteen cases and in two of these there was enough evidence to make a definite diagnosis of pre-eclamptic toxemia. There were eight colored women and five white which is about the usual proportion of entries of these races in the clinic. There were nine multiparae and four primiparae. Considering there is a normal weight increase in pregnancy of twenty-five pounds, there was a loss or a failure to gain normally in all of the nine cases in which the figures were obtained. The thyroid was abnormally enlarged in nine of the thirteen cases. None of these women showed exophthalmos or other eye signs. The urine contained from a trace to 2 plus albumin in six of the thirteen cases. There was no sugar found, which was surprising to us.

Observations on the basal metabolism rate were very carefully made by one of my graduate students, Dr. Busby, who was working on this test in normal pregnant and puerperal women. We were especially interested in comparing the toxic with the normal women as regards basal metabolism rate. We used a Krogh metabolimeter, and from four to eight readings were made on each case on different days. The readings were made after an hour rest period and six hours after a very light meal. All tests were discarded where it was evident the patient was under abnormal mental strain.

It will be seen that the basal rates varied markedly in the different cases. Thus Case 1 had a high reading antepartum of plus 38, a low reading antepartum of plus 16, and eight days postpartum it was 3.5.

TABLE I. MILD HYPERTROPHY

CASE	AGE	RACE	WEIGHT ¹	PARA	GOUTER	EXOPI- THALMIC	TOXIC SYMPTOMS	URINE	BLOOD PRESSURE	METABOLIC RATE			BABY	REMARKS
										HIGH	LOW	POSTPARTUM		
1	23	C	122 111	II	None	No	Headaches, diz- ziness, visual disturbance, edema	Neg.	110/70	+38	+16	+ 3.5 (8da.)	Good 3380 49	
2	23	C		I	Palpable	No	None	Neg.	105/70	+24	+ 8	+ 2.7 (7da.)	2750 47	Puerperal fever
3	26	W		I	Palpable	No	None	Alb. +	128/80	+27.8	+11	0.0 (7da.)	4000 53.5	Prolonged labor
4	20	C	125 142	I	Palpable	No	Edema	Alb. + casts	162/98	+18	+24	+16.0 (6da.) + 8.5 (8da.)	2260 45	Pre-eclamptic
5	18	W	128 144	I	Palpable	No	Headaches Edema	Alb. +	108/38	+55.1	+21.4	+ 1.6 (6da.)	3280 51.5	Overdue 10 days
6	34	C	117 118	III	Palpable	No	None	Neg.	128/75	+48	+18	- 4.0 (7da.)	3220 47	Rapid labor
7	19	C		II	Palpable	No	None	Alb. trace	114/68	+22			2780 42.5	
8	27	W	119 104	III	None	No	None	Alb. ++	104/75	+56	+24		2120 42.5	Hydrorrhea Gravidarum
9	26	C	132 114	IV	Palpable	No	Visual disturb- ance, edema	Neg.	104/70	+69.3	+54.6	+51.0 (8da.)	3700 50	Pre-eclamptic
10	36	W		IV	Palpable	No	None	Alb. trace	138/85	+39		+30.0 (8da.)	4290 52	Rapid labor
11	26	C	110 111	IV	None	No	Edema	Neg.	100/70	+26	+15	+15.5 (5da.)	2820 48	
12	32	W		II	Palpable	No	None	Neg.	112/85	+24	+14.5	+ 9.0 (5da.)	3270 49	
13	21	C	138 140	II	None	No	None	Neg.	124/80	+37	+25	+ 9.1 (6da.)	2350 45.5	

Case 8 had a plus 69.3 reading as the highest antepartum and 54.6 the lowest antepartum; the eight day postpartum reading was plus 51. This may have been due to an associated mild pre-eclamptic toxemia. The rates in general are rather low, some even well within the normal pregnancy limits, and this corresponds well with the diagnosis of a mild hyperthyroidism. It will be seen that a rate of over 30 was found in eight out of the thirteen cases. Normally in nonpregnant women it is said that a plus or minus 15 is not significant of pathologic hypersecretion. Most observers feel that normal pregnancy may raise the figure to 20 or even 30 but anything above 30 should be considered pathologic.

In those patients showing a basal rate under 25 there were in each case other symptoms upon which the diagnosis of hyperthyroidism was based. Two of the thirteen cases gave evidence of a pre-eclamptic toxemia as well as thyrotoxicosis. We were especially interested in this finding because of the statements of Ward¹¹ and others that the failure of the thyroid gland to increase its activity during pregnancy is one of the causes of eclamptogenictoxemia. Ward found that the use of saline extract of thyroid, normal human thyroid gland, seemed to affect favorably one case of hyperemesis gravidarum. He also had a patient with exophthalmic goiter who was cured by the injection of an antiserum and two years later became pregnant. She went through pregnancy perfectly normally, and on the fourth day postpartum she developed symptoms of exophthalmic goiter. He feels that the injection of saline extracts of human thyroid glands may favorably alter the metabolism in patients who have eclamptogenic toxemia or hyperemesis gravidarum.

Four of our cases displayed the clinical manifestations of toxic adenoma, Group II. The average age was thirty-one years old and all were multiparae. Two of the four had slight exophthalmos. Two had marked choking sensations and one a marked aphonia and dyspnea on lying down. Two had a 1 plus albumin in the urine and a basal rate of 50, and 105 was noted in two. This test was not made on the other two. Three of the four had symptoms of pre-eclamptic toxemia. All of the babies were born spontaneously and were normal in size and length. Weight loss was noted in one patient of the four. The apparent gain in Case 3 may have been due to pre-eclamptic toxemia with edema. Table II shows the data on these cases.

A consideration of these toxic cases, while few in number, leads us to a more conservative conclusion regarding the coexistence of thyrotoxicosis and pregnancy than that advanced by Gellhorn¹² who concludes that exophthalmic goiter and pregnancy constitute a serious menace for the mother. He believes that girls with a well-developed hyperthyroidism should be advised against marrying. If Graves' disease appears after marriage, conception should be prevented. The

quickest and best method of interruption is by means of a vaginal cesarean section, with tubal sterilization added. We feel that while his view may obtain for the extremely marked cases of exophthalmic goiter and especially if skilled surgical intervention is not available to the patient, we would hesitate in the light of our experience and that of others to advocate the same for all cases, particularly since it is well established that some of these patients are actually benefited by the pregnant state. We are of the opinion that every pregnant woman undergoes a readjustment of the functional activity of the ductless glands. When the readjustment results in a new balance being established, the patient is classified as a normal pregnancy. Various pathologic states may develop from a failure to establish a balance. Given, then, a patient with a disturbed balance before pregnancy begins, an adjustment more nearly to what is considered normal may be established by the pregnancy.

A review of the data in Group III shows five cases classified as exophthalmic goiter. Their average age was thirty years. Three of the five showed marked loss of weight, and four showed moderate exophthalmos. Three showed a slight trace of albumin in the urine, and one had a pressure of 176/96, with headache and epigastric pain and was thought to be a pre-eclamptic toxemia. One patient had a thyroidectomy after which she passed a blood mole. This case was transferred to us from the surgical division after the operation had been done and the abortion was in progress. Three of the five patients entered the ward with the diagnosis of hyperemesis gravidarum. The accompanying clinical manifestation of hyperthyroidism and the basal rate made the diagnosis of hyperthyroidism. Treatment directed at this condition resulted in a marked improvement of the vomiting. The babies were all well developed about term and left the hospital in good condition except one of the twins who died two days after birth in convulsions. Autopsy revealed numerous small hemorrhages in the brain. No abnormalities were noted in the thymus or in the thyroid. There were two colored women and three white women. The basal metabolic rate varied from plus 111 to plus 3 before delivery and was plus 15 and plus 8 after delivery in those cases in which a record was obtained. One of the five cases had not delivered at this writing. Table III shows the results of these cases.

An analysis of the eight cases operated on by Dr. Percy and Dr. Nadeau shows that the average age was twenty-eight years. Three of the eight had considerable loss of weight. Toxic symptoms and enlargement of the gland were present in all. There were none of the symptoms either of hyperemesis gravidarum or pre-eclamptic toxemia. One of the eight cases aborted before leaving the hospital. Four of the cases were diagnosed clinically and histologically as exophthalmic goiter, and three were toxic adenomas. The remaining case was classi-

TABLE II. TOXIC ADENOMA

CASE	AGE	RACE	WEIGHT	PARA	GOITER	EXOPI- THALMIC	TOXIC SYMPTOMS	URINE	BLOOD PRESSURE	METABOLIC RATE			BABY	REMARKS
										HIGH	LOW	POSTPARTUM		
1	28	C	120 145	IV	Enlarged adenoma	No	None	Alb. +	120 80				3240 46.5	None
2	20	C		II	Three times normal	No	Epigastric pain, edema vomiting	Alb. +	134 90				2960 50	Pre-eclamptic toxemia
3	34	W	178 203	IV	Nodular asym- metrical	Slight	Headache edema dyspnea aphonia	Neg.	154 92	+ 50	+39.4	+40 (6 da.) +29.4 (7 wk.) +24.8 (8 wk.)	3260 51	Lugol's after Oct.
4	41	W	216 196	VIII	Bilateral	Slight	Headaches ver- tigo aphonia epigastric pain	Alb. +	216 196	+105	+47	+26 (8 da.) +23 (7 wk.) + 8.3 (9 wk.)	3660 49	

TABLE III. EXOPHTHALMIC GOITER

CASE	AGE	RACE	WEIGHT	PARA	GOITER	EXOPI- THALMIC	TOXIC SYMPTOMS	URINE	BLOOD PRESSURE	METABOLIC RATE			BABY	REMARKS
										HIGH	LOW	POSTPARTUM		
1	31	W	95 108	II	Moderate firm	Yes	Edema	Alb. +	128 78	+ 53			3220 46.5	Mitral stenosis
2	32	W	160 215	III	Old scar	Mod.	Headache epi- gastric pain	Neg.	176 95	+ 34			3360 46	Pre-eclamptic
3	37	W	165 133	X	1927 thyroid	No	None	Neg.		+ 3		+ 8	Blood mole	Mitral regurgitation
4	30	C	146 107	I	Moderate	Mod.	Nausea exhaus- tion	Alb. +	108 52	+111	+20	+15	Twin	Hyperemesis gravidarum
5	22	C	171 129	I	Moderate firm	Mod.	Nervous pulse 140 nausea	Alb. trace	100 54	+109	+12			Not delivered hyperemesis

CASE	AGE	RACE	WEIGHT LOSS	PARA	GOITER	EXOPH- THALMIC	TOXIC SYMPTOMS	URINE	BLOOD PRESSURE	OPERATION PATHOLOGY	ANESTHETIC	BABY	REMARKS
1	30	W	60	II	Small firm enlarged		Headache	Neg.	144 60	Exophthalmic double lobec- tomy	Ethylene		2½ months
2	19	W	Sl.	II	Asymmetrical soft enlarged		None	Neg.	120 70	Toxic adenoma double lobec- tomy	Ethylene		4 months
3	37	W	19	VI	Firm enlarged		None	Neg.		Exophthalmic lobectomy	Ethylene local	Mis- carried	10 days post- operative miscarried
4	30	W	None	I	Right lobe enlarged nodular	No	None	Neg.	126 72	Toxic adenoma double lobec- tomy	Local		2 months
5	32	W	35	III	Bilateral enlarged		None	Neg.		Toxic adenoma double lobec- tomy	Local		6 weeks
6	30	W	Sl.	V	Moderate enlarged		None	Neg.		Exophthalmic double lobec- tomy	Local	Term twins	5 months toxic in all but 3rd
7	32		Sl.	I	Slight enlarged		None	Neg.		Exophthalmic double lobec- tomy	Local	Term good	2½ months
8	23			II	Marked bilateral enlarged		None	Neg.		Colloid goiter double lobec- tomy	Local		4 months

TABLE V. CASES OF DR. SEED

CASE	AGE	RACE	WEIGHT LOSS	PARA	GOITER	EXOPH- THALMIC	TOXIC SYMPTOMS	URINE	BLOOD PRESSURE	OPERATION PATHOLOGY	ANESTHETIC	BABY	REMARKS
1	30	W	30	II	Marked	Yes	Nervousness, dyspnea ascites	Neg.	Normal	Exophthalmic ligation double lobectomy	Local nitrous oxide	Miscar- ried	6½ months
2	33	W	25	II	Marked	No	Dyspnea, tachycardia	Neg.	Normal	Adenoma double lobec- tomy	Nitrous ox- ide	Twins good	3 months

fied as a colloid goiter with toxic symptoms. The basal metabolic rate was not studied in these cases, and I am told by Dr. Percy that he relies very little on this test in handling these cases. The résumé of these cases is presented in Table IV.

A résumé of Dr. Seed's cases is seen in Table V. One was a thirty-year-old white girl who had been in St. Luke's Hospital, Chicago, for two months under medical management. He did a ligation of both superior thyroid arteries in spite of the fact that she was two months pregnant. She was advised to return in a month but waited about the sixth month and entered with marked dyspnea and cardiac decompensation, ascites, and generally poor condition. A right lobectomy was done, and she aborted at six and a half months. A second lobectomy nearly a year later was necessary, and since then she has been normal.

The second case was a thirty-two-year old para ii, with a basal metabolic rate of plus 42. She had had a marked adenomatous goiter with symptoms for several years. A thyroidectomy was done during the third month of pregnancy. She had a smooth postoperative course and delivered twins normally six months later. She lost all goiter symptoms following thyroidectomy.

It is, therefore, seen that on the whole good results are obtained from both the surgical or radical method of handling toxic goiter and the conservative or medical method. It would seem that the medical management should be used in all cases primarily. That the goiter surgeon should be called upon at any stage of the pregnancy to operate when it is evident from the basal rate and the clinical manifestations that the patient is either not improving or at least holding her own. If this intervention can be postponed until viability of the baby, so much the better. From the statistics here given it would seem that local anesthesia is most satisfactory from the surgical standpoint, and as far as contributing to abortion is concerned, it is the ideal anesthesia. The obstetrician should be ready to perform a vaginal or abdominal cesarean section, according to the indications present in the individual case. Teamwork between obstetrician and surgeon is the ideal arrangement and will give the best results.

CONCLUSIONS

From a consideration of these cases it would seem that the following conclusions are justified:

1. Mild hyperthyroidism as judged by the clinical manifestations and the basal metabolic rate is a not uncommon complication of pregnancy, and no special treatment is necessary.
2. Many of the nervous symptoms seen in pregnancy are probably due to abnormal activity of the thyroid gland induced by the pregnant state.

3. Exophthalmic goiter symptoms may manifest themselves first during pregnancy and if present before conception usually are aggravated but may be ameliorated.

4. The vomiting and toxic symptoms of an exophthalmic goiter during pregnancy are apt to be wrongly diagnosed as hyperemesis gravidarum.

5. These patients may best be treated conservatively with bed rest and Lugol's solution, as long as improvement occurs, withholding surgical intervention until it is evident that medical management has failed or, if possible, until the thirty-fifth week when premature delivery following thyroid operation will be harmless to the baby.

6. Operation skillfully performed even in the early months of pregnancy offers a fairly good chance for the baby in exophthalmic goiters and toxic adenomas. Maternal mortalities have been obtained as low as 0.5 per cent, the average maternal mortality being 1 per cent.

7. Toxic adenomas can also be best handled conservatively unless the pressure or toxic symptoms are too severe when lobectomy is indicated.

8. Labor is well supported by these patients, but to spare them as much as possible shortening of the second stage by operative intervention when conditions are favorable is advised.

9. Seriously intoxicated patients first seen late in pregnancy, who do not respond to medical management, may best be delivered by vaginal or abdominal cesarean section.

10. The babies born of mothers who manifested all grades of hyperthyroidism, mild, exophthalmic, and toxic adenoma, showed no clinical evidence of goiter.

REFERENCES

- (1) *Falta, Meycr*: The Ductless Glandular Diseases, P. Blakiston's Son & Co., Philadelphia, 1915, p. 379. (2) *Seitz*: Verhandl. d. deutsch. Gesellsch. f. Gynäk. 15: 393, 1913. (3) *Howard, C. P.*: Endocrinology and Metabolism, D. Appleton & Co., New York, 1922, p. 308. (4) *Fabre, Maurice*: Bull. Soc. d'obst. et de gynéc. 15: 559, 1926. (5) *Porter, Miles F.*: Am. J. Obst. & Dis. Women 64: 781, 1909. (6) *Stowe, H. M.*: Am. J. Obst. & Dis. Women 59: 789, 1909. (7) *Goodell and Conn*: Surg. Gynec. Obst. 457, 1911. (8) *Mussey, R. D.*: J. A. M. A. 77: 1009. (9) *Davis, C. H.*: J. A. M. A. 87: 1004, 1926. (10) *Carlson, A. J.*: Am. J. Physiol. 33: 95, 1914. (11) *Ward*: Surg. Gynec. Obst. 9: 617, 1909. (12) *Gellhorn*: Am. J. Obst. & Dis. Women 68: 1132, 1913.

1817 W. POLK STREET.

THE RELATION OF BASAL METABOLISM TO GESTATION*

BY JENNINGS C. LITZENBERG, M.D., AND JAMES B. CAREY, M.D.
MINNEAPOLIS, MINN.

(From the Departments of Obstetrics and Gynecology and of Medicine of the
Nicollet Clinic)

INTERFERENCE with the reproductive function manifested by menstrual abnormalities, sterility and abortions are so common and the causes so numerous and elusive that any evidence which indicates even one cause, is worthy of our careful consideration.

Examination of the female pelvis is not sufficient. A complete and meticulously conducted study of the woman is necessary and, in the case of sterility, of the husband as well. This requires the cooperation of the gynecologist-obstetrician, the internist and endocrinologist, the genito-urologist, and the laboratory.

In the course of such cooperative investigation during the past seven years we have observed that lowered metabolism is present in a large percentage of cases of menstrual disturbances and sterility and to a definite but lesser proportion of repeated abortions.

In a preliminary report by one of us in 1926 upon *The Relation of Basal Metabolism to Sterility*,¹ attention was drawn to the possibility of deficient metabolism as a cause (or index of a cause) of sterility. Fifty per cent of the sterile women reported had a low basal metabolic rate and of the cases treated with thyroid extract, one-third conceived. One woman of the group became pregnant three times under treatment, bringing the percentage of conceptions to 40.

In that preliminary report the following tentative summary was made: "Definite conclusions cannot be drawn but there is a significance in the findings which demands further investigations to establish the truth or falsity of the possibility that moderate hypothyroidism may be a cause (or index of a cause) of sterility."

Further study and continued experience have convinced us that deficient metabolism does interfere with the reproductive function. "The relation of the thyroid gland to the sex organs is the most ancient and classical interrelation of the functions of the glands of internal secretion. Known to the ancients and a subject of daily gossip, it has passed down through the ages." (Marine.²)

No new evidence is necessary to prove that the marked degrees of altered thyroid function interferes with the reproductive organs for it is a matter of common knowledge that with both the hyperfunction of exophthalmic goiter and the hypofunction of myxedema, menstrual disturbances are common and conception rare. We have excluded all such cases, for our study is concerned only with the woman with a

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

metabolic rate slightly below normal and showing no other signs of myxedema.

It would seem apparent that any deviation from the normal rate must be due to thyroid influence and inasmuch as the patient usually responds to thyroid medication we have used the term "hypothyroidism" in spite of the fact that clinicians in general seem reluctant to attach a diagnosis of hypothyroidism to a patient with low metabolic rate.

Our material was derived from 2,500 consecutive determinations of the basal metabolic rate in all types of patients, of whom 758 had a rate of minus ten or lower. We have studied the women in two groups.

The first group of 137 women includes all the women with low basal metabolism, whose records contained sufficiently accurate data to warrant analysis. The second is a group of 52 sterile women, all with low basal metabolism and all treated with thyroid substance. None of the women in either group showed any other evidence of myxedema. In the first group of 137 women, 78 were married, of whom 35 women or 45 per cent were sterile.

In addition there were 15 cases of relative sterility or cases presenting the following abnormalities: (1) No living children, but one or more stillbirths, miscarriages or abortions (6 cases); (2) one or more living children, but also one or more stillbirths, abortions or miscarriages (9 cases). Sterility, actual or relative occurred, then, in 56 per cent of this series, more than four times the incidence in the United States, according to Lotka³ who says that sterility occurs in 13 per cent of the white women of the United States.

Forty-four per cent of the 137 women with a low rate had menstrual difficulties: amenorrhea, irregularity, menorrhagia, metrorrhagia, dysmenorrhea, and scanty flow. There was no pelvic condition in any of these cases to account for the symptoms. A goodly percentage of women with abnormal menses are improved by thyroid and hygienic measures, as are also the women who habitually abort, who can be carried through to term.

In the second group of 52 sterile women, 33 or 63 per cent had abnormal menses, 15 or 28.8 per cent had abortions. All of the 52 women with a low basal metabolic rate were treated with thyroid extract upon the supposition that the low rate was due to thyroid influence. Seventeen or 30 per cent of conceptions followed the treatment, one woman becoming pregnant four times and another twice. One woman had twins and two aborted once, giving us as a result of our treatment sixteen babies, a result certainly justifying the treatment.

We believe that the basal metabolic rate should be taken in all cases, when no other cause of sterility can be found, either in the wife or her husband.

SUMMARY

Rearranging the data of the two groups and bringing them up to date (from January, 1928) by the addition of a few recent cases, we find that in 91 cases of sterility, 52 women or 57 per cent had a metabolic rate below normal, of whom 36 per cent had abnormal menses. Thirty per cent of the 52 women became pregnant following treatment, two of them aborted (the treatment having been discontinued after conception), while fifteen of the same group had aborted one or more times before treatment, indicating that the normal metabolic rate should be maintained during pregnancy. It seems to us that the results of our studies leave little room for doubt and we are personally convinced that lowered metabolism, even to a very moderate degree, interferes with the reproductive function.

When we observe that of 137 women with a lowered metabolism, 45 per cent are sterile and of 91 sterile women, 57 per cent have a low basal metabolic rate, it is difficult to escape the conviction that there is a very definite relation between metabolism and the reproductive function.

If the statement be true that the reproductive cells are more subject to deleterious influences than any other cells in the body, our findings are not difficult to understand.

CONCLUSIONS

1. Lowered metabolism, even to a moderate degree, interferes with the reproductive function in a large percentage of cases as is shown by disturbed menses, sterility, and interruption of pregnancy.

2. One-third of all women studied, who had a low metabolic rate and nearly two-thirds of the sterile women with a low rate had abnormal menstruations.

3. Nearly one-half of all the women with a decreased metabolism were sterile and more than one-half of the sterile women had a basal metabolic rate below normal.

4. A little less than one-third of the women with a low rate who conceived, aborted, some of them repeatedly.

5. Restoring the basal metabolic rate to normal by thyroid medication (and hygienic measures), in many cases, improves menstruation, permits conception, and prevents interruption of pregnancy.

6. Therefore, in all cases where no other cause is found for abnormal menses, sterility, and abortions, the basal metabolic rate should be determined and if found low, should be restored to normal by proper treatment.

REFERENCES

- (1) *Litzenberg*: AM. J. OBST. & GYNEC. 12: 706, November, 1926. (2) *Marine*: Physiologic Rev. II, October, 1922. (3) *Lotka*: Proc. Nat. Acad. Sc. 14: 99, June, 1928.

DISTURBANCES IN CARBOHYDRATE METABOLISM IN TOXEMIA OF PREGNANCY*

A PARTIAL ANSWER TO THE J. WHITRIDGE WILLIAMS QUESTIONNAIRE ON ECLAMPSIA†

BY PAUL TITUS, M.D., PITTSBURGH, PA.

(From the Department of Obstetrics and Gynecology, St. Margaret Memorial Hospital)

SOME time ago Dr. J. Whitridge Williams¹ stated that in order for any theory (of eclampsia) to be regarded as acceptable, it must explain satisfactorily certain pathologic and clinical facts, of which the following may be mentioned: (A) The genesis of the characteristic hepatic lesions; (B) the predisposing influence of primiparity, multiple pregnancy and hydramnios; (C) the disease is more common in northern countries than in the tropics; (D) its incidence increases as pregnancy approaches term; (E) marked edema is usually a favorable sign; while its absence adds to the gravity of the prognosis; (F) true eclampsia rarely occurs, whereas chronic nephritis gives rise to increasingly serious trouble in each succeeding pregnancy; (G) intra-uterine death of the fetus is usually followed by improvement and, (H) a milk diet, which is high in protein and mineral constituents, is as efficacious as one low in protein and free of salt.

In addition to these questions I would suggest that explanation should also be made of the following: Under B, that preeclampsia and eclampsia are frequently seen with hydatidiform mole. Under C, that the incidence of eclampsia is increased by sudden changes in the weather. Under D, that convulsions and other symptoms of eclampsia occur in the early weeks of pregnancy in only two conditions; namely, hydatidiform mole and acute yellow atrophy of the liver. Finally to develop a satisfactory theory of eclampsia its etiologic relationship to any similar morbid changes occurring in nonpregnant human beings or in pregnant lower animals should be shown.

GLYCOGEN DEFICIENCY THEORY OF TOXEMIAS

The "glycogen deficiency theory"² of the origin of pregnancy toxemias is, in brief, that an insufficient carbohydrate intake in the maternal diet plus the sudden and extraordinary demands of fetal and placental growth and uterine hypertrophy cause a glycogen de-

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

†This paper is one of a series of investigations on the subject of the Pregnancy Toxemicoses being conducted under the generous provisions of the John C. Oliver Memorial Research Foundation at the St. Margaret's Memorial Hospital.

iciency in the body tissues especially noticeable in the liver. This may be either a slowly progressing process or may have acute and even fulminating phases.

The application of the Williams questionnaire to this theory and its supporting facts follow in the ensuing paragraphs in the sequence suggested by Williams and already outlined.

A. GENESIS OF LIVER LESIONS

The genesis of the necrotic liver lesions has been explained as being the result of an excessive glycogen depletion of the hepatic cells, now known to be followed by a fat replacement, tantamount to necrosis. This may be duplicated experimentally by starvation, and is to be seen to a lesser degree in certain of the wasting or "hunger diseases" (Opitz³). The earlier stages of this depletion-necrosis have been described as normal or physiologic to pregnancy (Hofbauer⁴). A research now nearing completion in our clinic seems to indicate that to administer to an animal over a period of many days gradually increasing and finally lethal doses of insulin while on a constant diet causes a glycogen depletion with pathologic changes in the liver closely resembling those of the pregnancy toxemias.

Bell⁵ states that the necrotic liver lesions seen in pregnancy toxemias do not show the differences in the various clinical types of toxemias which Williams believes to be characteristic of them. That is to say that the necrotic areas are by no means limited to the center of the lobules in hyperemesis and acute yellow atrophy nor to the periphery in eclampsia. Our own work agrees with this.

In summary it may be said that the liver lesions seen in pregnancy toxemias may be imitated experimentally, and that there is open question as to their having distinctive characteristics in the various phases of pregnancy toxemias.

B. INFLUENCE OF PARITY, PLURAL PREGNANCIES, AND HYDRAMNIOS

I have no explanation to offer for the reported predisposing influence of primiparity.

Referring to the second part of this question it is obvious since the glycogen content of the placenta is relatively greater than all other fetal organs, according to McAllister,⁶ that the larger the placenta the greater the glycogen drain on the maternal organism.

In multiple pregnancy with double or more the amount of placental tissue the glycogen requirements of two or more fetuses are correspondingly increased, to the mother's detriment.

In syphilis the placenta is proportionately much larger than in normal pregnancies and the relation between syphilis and hydramnios is well known.

It may be added that hyperemesis, as might be expected, is especially common in multiple pregnancies, in syphilitic pregnancies and with hydatidiform mole. In this latter condition there is an enormous hypertrophy of chorionic tissue which must perforce argue a glycogen depletion elsewhere, sufficiently rapid and acute to produce eclampsia in certain instances.

C. GEOGRAPHIC DISTRIBUTION OF ECLAMPSIA

A ready explanation of the comparative rarity of eclampsia in the tropics is that in tropical countries the diet is predominatingly carbohydrate as compared to that of northern countries. It will be remembered that in Germany during the War, the incidence of eclampsia was noticeably diminished, according to Gessner⁷ and others. This was attributed to the increase in the consumption of carbohydrate foods and the general lack of meat in the war-time diet of the civilian population.

On the other hand the incidence of eclampsia among the Esquimaux is not excessive,⁸ the reason for this being readily comprehended. Traders now supply even the natives of the outlying Arctic regions with canned vegetables and fruits, but even among those tribes whose diet is still almost entirely meat or protein, the continued cold and the freedom from sudden changes in the weather prevent the unexpected metabolic upsets common to quick changes in body-heat requirements.

Eclampsia is most common in the temperate zones which are subject to all degrees of sudden changes in external temperatures, especially in the Spring and Fall. This zonal frequency and the seasonal incidence of eclampsia may reasonably be explained by certain observations of Embden, Lutze, and Lufman.⁹ "There is an increase in blood sugar in cold weather and a corresponding decrease in warm weather under similar conditions of food intake or nourishment. Metabolic rates are normally increased in cold weather and decreased in warm weather to satisfy the body heat requirements in response to external temperatures." Increased metabolism to increase body heat means increased consumption of glycogen as fuel and thus is an additional drain on the reserves. Abrupt changes in the weather might therefore readily initiate the fluctuations in blood sugar which we have shown to be characteristic of eclampsia,¹⁰ and we already know that such weather changes do increase the incidence of eclampsia.^{11, 12}

A pregnant woman whose metabolic balance has already become dangerously unstable by reason of a dietetic insufficiency might require nothing more than a sudden cold spell to upset it completely. The influence of weather changes on the incidence of hyperemesis is also noticeable.

D. ECLAMPTIC TOXEMIA A DISEASE OF LATE PREGNANCY ONLY?

The fetal requirements naturally increase as growth proceeds and physiologic resistance to this drain may be lessened as time goes on. We^{10, 13} have previously suggested that the chief difference between the clinical symptoms of the toxicoses of early and of late pregnancy is due to the fact that the former is a slow, and the latter an acute, rapidly progressing process. In early pregnancy the fetal requirements are less and the demands are more gradual so that the glycogen depletion of hyperemesis which has been demonstrated¹³ rarely is swift enough to cause convulsions. Occasionally, however, we see that fulminating process termed acute yellow atrophy of the liver which is pathologically identical with hyperemesis but is so acute that eclampsia-like convulsions usually occur. Thus, there is afforded a connecting link between the toxemias of early and late pregnancy.

Hydatidiform mole in which hypertrophy of fetal (chorionic) tissue goes on at a rate many times more rapid than that of usual fetal growth is frequently able to develop typical eclampsia in the third or fourth months of the gestation. In other words if conditions of late pregnancy are simulated eclampsia may occur in the early weeks of pregnancy.

E. THE FAVORABLE SIGNIFICANCE OF EDEMA

Marked edema with nephritis from any cause is now conceded to be a protective measure. Clinicians in general state that the toxins which collect in an attack of acute nephritis are diluted by edema in the tissues and that the prognosis is thereby made more favorable. Therefore this is not peculiar to eclampsia.

F. RELATIONSHIP BETWEEN ECLAMPSIA AND CHRONIC NEPHRITIS

The investigations of Harris¹⁴ on eclamptic women after delivery at the Johns Hopkins Hospital show that an attack of eclampsia does not leave their kidneys as entirely unimpaired as was previously supposed.

May it not be that these kidney conditions are relative and that pre-existing chronic nephritis makes a predisposition and increasing susceptibility to such trouble during each pregnancy? A woman who survives an attack of true eclampsia may then go through subsequent pregnancies with the help of the better prenatal care which she must seek and demand after such an experience unless she is totally benighted. Do we know however that she has not become a potential nephritic? Harris' findings indicate that she often does and these states therefore may be thought of as being related rather than divorced as originally suggested.

II. APPARENT FALLACIES IN DIETETIC TREATMENT

Recent investigations of Harding and Van Wyck¹⁵ seem to indicate that a high protein diet is not as serious in these states as was previ-

ously thought. My coworkers and I have long believed that a protein diet is not so damaging by direct "irritation" as it is by what it lacks. Finally it should be pointed out that a milk diet even though high in protein is also high in sugar content and therefore should be efficacious according to our theories.

POSSIBLE SIMILARITY OF ECLAMPSIA TO OTHER DISEASES

In reply to our own final question as to a relationship between pregnancy toxemias and similar conditions in the nonpregnant or in animals, it may be said that eclampsia resembles "acute yellow atrophy of the liver" in the nonpregnant and that this too shows a hypoglycemia; that eclampsia and hypoglycemia from insulin overdosage are extraordinarily alike, and that the toxic symptoms of the latter may be produced (John¹⁶) as are eclamptic convulsions at any level of blood sugar from 200 mg. or more down if this level has been suddenly reached and follows an overdosage of insulin given at a still higher level ("relative hypoglycemia");¹⁰ that the experimental extirpation of the liver in dogs (Mann and Magath¹⁷) closely resembles a true eclamptic state; that both dogs and cows are said by veterinarians to have diseased states closely resembling eclampsia in humans. In connection with this latter it is interesting to note that Widmark and Carlens¹⁸ have made a study recently of parturient paresis in cows. Williams¹⁹ has referred to the opinions that this is a disease of lower animals closely resembling eclampsia. These authors now find it to be a lactation hypoglycemia, immediately relieved by intravenous injections of dextrose, the same treatment suggested empirically by me in 1920 for eclampsia.

The usual effective treatment of parturient paresis, namely, injection of air into the udder may reasonably owe its efficacy to the pressure which temporarily checks lactation with its sudden drain of body sugar.

COMMENT

Under no circumstances would I wish to be misunderstood as saying that the carbohydrate deficiency or glycogen depletion theory is a completely satisfactory or full explanation of the origin of pregnancy toxemias. Obviously such conditions are complex affairs and probably no one simple explanation can ever be found to account for them fully. I maintain merely that to class pregnancy toxemias as being associated with depletion of the body stores of glycogen and secondary hypoglycemia, explains more fully and more consistently the vagaries of these complex states than has been done heretofore.

It is unfortunate that Zweifel should have dubbed eclampsia the "disease of theories." In the face of such a term one feels considerable temerity at advancing any further theories, yet it is only by the

development of strong convictions to be persistently investigated, weighed, and criticized that the mystery of these conditions will ever be solved. I have no feeling of apology for having become so engrossed in the study of pregnancy toxemias for these past ten or twelve years, nor do I believe that anyone who does likewise has the presumption to believe that he alone can solve something which so many others have failed to elucidate. The fascination of the study of this complicated disease is sufficient reward even if there are no other results.

My attempt to apply these ideas to Dr. Williams' questionnaire has not been in the conceit that they supply the full answer. On the contrary it has been done merely in an effort to see wherein the fabric which I have been trying to weave fails to cover the splendid and thoughtful pattern laid down by Dr. Williams.

If by pointing out these deficiencies this paper supplies a few suggestions for further research it will have been warranted.

REFERENCES

- (1) *Williams, J. Whitridge*: Obstetrics, D. Appleton & Co., New York, 1923, ed. 5, p. 609.
- (2) *Titus, Paul, Hoffman, G. L., and Givens, M. H.*: J. A. M. A. 74: 777, 1920.
- (3) *Opitz, E.*: Klin. Wchnschr. 3: 469, 1924.
- (4) *Hofbauer, J.*: Ztschr. f. Geburtsh. u. Gynäk. 61: 200, 1907.
- (5) *Bell, J. W.*: AM. J. OBST. & GYNEC. 12: 792, 1926.
- (6) *McAllister, J.*: J. Obst. & Gynec. Brit. Emp. 24: 91, 1913.
- (7) *Gessner, W.*: Zentralbl. f. Gynäk. 43: 1033, 1919.
- (8) Private communication from a Moravian missionary obtained for author by Sir Wilfred Grenfell, Labrador.
- (9) *Emden, Lütze, and Lufman*: Quoted by W. Benthin, Ztschr. f. Geburtsh. u. Gynäk. 69: 198, 1911.
- (10) *Titus, Paul, Dodds, Paul, and Willetts, E. W.*: AM. J. OBST. & GYNEC. 15: 325, 1928.
- (11) *Davis, A. B., and Harrar, Jas. A.*: J. A. M. A. 87: 233, 1926.
- (12) *Heuss, V.*: Ztschr. f. Geburtsh. u. Gynäk. 91: 323, 1927.
- (13) *Titus, Paul, and Dodds, Paul*: AM. J. OBST. & GYNEC. 16: 90, 1928.
- (14) *Harris, J. W.*: Bull. Johns Hopkins Hosp. 35: 103, 1924.
- (15) *Harding, Victor J., and Van Wyck, H. B.*: J. Obst. & Gynec. Brit. Emp. 33: 17, 1926.
- (16) *John, Henry J.*: Am. J. Med. Sc. 172: 96, 1926.
- (17) *Mann, F. C., and Magath, T. B.*: Trans. Soc. Path. & Physiol., Am. Med. Assn., 1921, p. 29.
- (18) *Widmark, E. M. P., and Carlens, O.*: Biochem. Ztschr. 156: 454, 1925.
- (19) *Williams, J. W.*: Obstetrics, D. Appleton & Co., New York, 1923, ed. 5, p. 618.

1015 HIGHLAND BUILDING.

INFECTION IN THE PUERPERIUM, WITH ANALYSIS OF 8000 CASES*

BY FRED L. ADAIR, M.D., MINNEAPOLIS, MINN.,
AND L. J. TIBER, M.D., ST. PAUL, MINN.

WE ALL realize that puerperal infection remains one of the great problems for the obstetricians to solve. It is true that it is recognized as being a preventable infection, but this is not absolutely true and it still remains one of the two great causes of maternal mortality and of a morbidity the extent of which cannot be calculated. It is generally considered to be an infection which is introduced from without at or near the time of delivery. This is doubtless true in most instances. Yet, there seem to be a few cases where virulent organisms are harbored within the genital tract of the individual and still others, rare perhaps, where the offending organism is deported from some more remote tissue to lodge in or around the recently traumatized and weakened genitalia.

Granting the impossibility of not unintentionally and occasionally exposing the mother to these infectious agents by either the exogenous or endogenous route, we have still failed to solve the problem in its entirety. Results indicate that it is not possible to infallibly protect groups of mothers from the danger of infections which at times become serious and too often fatal. There are obviously other factors at work. It happens too frequently to be accidental that one woman with a normal uncomplicated delivery becomes infected while another, confined at nearly the same time, in almost the same environment, but delivered operatively, remains free from infection. Why should one woman without operative manipulation die from a rapidly fatal infection while another acquires a slight infection or one which runs a mild course to recovery? Is this all to be attributed to a difference in the virulence of the infecting organism and to variations in aseptic technic, or is it in part due to the resistance and immunity of the woman? Undoubtedly both factors are of enormous importance, but greater consideration has been given to a study of the various bacteria which infect these mothers and to the development of aseptic care than has been manifested in the other side of the picture.

It is well known that there are many racial and individual immunities to different diseases. These are of course both natural and acquired. It is useless and unnecessary to go into the details of this

*Presented and read as a thesis for admission at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Canada, September 10-12, 1928.

*The complete paper cannot be included here for lack of space. It will be published in full in the current volume of the Association's transactions and in the author's reprints.

general problem at this time, but it may be interesting to note some peculiarities in relation to certain diseases with which the streptococcus is definitely recognized as being associated. One of the diseases is scarlatina, which is usually quite definitely recognized and ordinarily remembered by the patient. This disease generally confers immunity against a subsequent attack. Why might it not confer more or less immunity to a later occurrence of a puerperal infection with streptococcus, which is the most frequent and dangerous agent of this disease, as well as to other streptococcic infections?

Hofbauer¹ has been studying the local defense mechanism and your President, Dr. Palmer Findley,² called attention to this field of endeavor two years ago in his presentation "The Biologic Defense in Puerperal Infection." Dr. Arthur L. Bloomfield³ has been studying "The Association of Susceptibility to Scarlet Fever and Acute Tonsillitis" and draws the conclusion that certain people possess a natural or at least unexplained resistance to hemolytic streptococcic infection of the lymphadenoid tissue of the throat. There is a significant positive association between susceptibility to two types of infection of this sort, acute follicular tonsillitis, and scarlet fever.

Geller,⁴ in his study of the bactericidal power of the blood in pregnancy and the puerperium, found a decided rise in the bactericidal index during the twenty-four hours following delivery. He regards this of special significance because it occurs at a time when the antibodies and the cellular defense, or so-called granulation wall, have not yet developed. He recognizes that other factors may play an even more important rôle.

In a study of streptococcic diseases and their prevalence in Illinois⁵ during the past seventy-five years, one is struck by an apparent relationship between the incidence of a group of diseases known or suspected of being due to infections with the streptococcic group of organisms. The diseases considered in this analysis are erysipelas, scarlet fever, septicemia, and rheumatism. In early days these diseases were very prevalent and in many instances they assumed epidemic proportion in various communities with higher fatality rates than at the present day. One of the significant improvements in the last half century is the lessened prevalence and lowered virulence of most members of this group. The Illinois death rates from scarlet fever have declined from 98.7 per 100,000 of population in 1860 to 11.5 in 1890, and those of Chicago from a rate of 114.7 to 16.1 for the corresponding years. The rate for the years⁶ 1919 to 1925 was 3.0 for Illinois and that for Chicago was the same.

In Minnesota⁶ the mortality rate for 100,000 inhabitants for scarlet fever was 6.0. This covers a period of seven years, from 1919 to 1925. The rate in Minneapolis for the years 1925 and 1926 was five and six respectively.

It is commonly said that there has been no decrease in the mortality rate from puerperal fever. This may be correct for the past twenty or twenty-five years, but it is not true if a longer period is covered as it shows a downward trend corresponding to other streptococcic diseases.

These results are common experiences as are seen from Table I, which gives some data relative to scarlet fever and erysipelas. It is interesting to note, however, that there has not been in recent years the same downward trend with reference to puerperal septicemia as is noticed in the other two diseases. A similar condition is shown in Table II, in which the rates for scarlet fever and puerperal septicemia are compared. In Table IV a similar situation is revealed, and in addition a comparison is made between the rates of scarlet fever and puerperal infection for the colored and white population.

There seems to be a definite difference in the susceptibility of the white and colored races to scarlet fever and puerperal septicemia. This is shown in Tables I and IV. The mortality among the colored

TABLE I. MORTALITY RATES FROM SCARLET FEVER, ERYSIPELAS, AND PUERPERAL SEPTICEMIA PER 100,000 ESTIMATED POPULATION FOR WHITE AND COLORED PERSONS, U. S. DEATH REGISTRATION AREA, 1910-1925 (8)

YEAR	SCARLET FEVER			ERYSIPELAS			PUERPERAL SEPTICEMIA		
	TOTAL	WHITE	COLORED	TOTAL	WHITE	COLORED	TOTAL	WHITE	COLORED
1910	11.6	12.0	3.4	4.5	4.6	4.0	7.2	7.0	13.1
1911	8.9	9.2	1.5	4.2	4.3	2.9	7.4	7.1	13.3
1912	6.7	6.9	1.6	3.8	3.9	2.5	6.5	6.2	12.4
1913	8.7	9.0	2.9	4.0	4.1	2.3	7.2	7.0	11.4
1914	6.6	6.9	1.5	3.8	3.9	2.0	7.1	6.8	13.1
1915	3.6	3.7	1.2	3.5	3.6	2.1	6.3	6.0	10.7
1916	3.3	3.5	1.1	3.8	3.9	1.8	6.7	6.4	10.8
1917	4.2	4.5	0.8	3.8	4.0	2.0	6.9	6.6	11.9
1918	3.0	3.3	0.4	3.2	3.3	1.7	6.5	6.0	11.7
1919	2.8	3.0	0.5	2.6	2.7	1.2	5.8	5.4	10.5
1920	4.6	4.9	0.8	3.1	3.2	1.7	6.6	6.2	11.7
1921	5.3	5.7	1.1	2.8	2.9	1.5	6.8	6.3	11.5
1922	3.5	3.8	0.7	2.5	2.6	1.0	5.7	5.2	10.4
1923	3.5	3.8	0.9	2.7	2.8	1.1	5.8	5.4	10.4
1924	3.1	3.4	0.6	2.5	2.6	1.3	5.8	5.2	11.1
1925	2.7	2.9	0.7	2.4	2.5	1.3	5.5		

people is definitely less than among the white people for both scarlet fever and erysipelas. This is especially noticeable in the former disease. It seems to be generally recognized among those who come in contact with the colored race that they are less susceptible to infection with scarlet fever than are the whites.

Doull,⁷ in discussing the incidence of measles, scarlet fever, diphtheria, and so forth, in Brazil notes marked variations in the mortality from scarlet fever in the northern and southern states of the United States. It is definitely greater in the northern than in the southern states, which is possibly due to the large number of negroes in the latter. The situation is reversed when one compares the mortality of the two races from puerperal septicemia, the mortality among the

negroes from this disease being almost twice as great as among the whites. One might argue that this is due to greater exposure to infection on account of poorer obstetric care among the negroes. The experience of those conducting clinics where both whites and blacks are admitted seems to indicate that the latter are more susceptible to puerperal sepsis. It is interesting also to note the trend of these diseases during recent years. In the past fifteen years the general mortality rate from scarlet fever has been markedly reduced for both whites and blacks in the Death Registration Area as shown in Table I. That this reduction is almost world-wide is shown in Table II. The same prog-

TABLE II. COMPARATIVE DEATH RATES FROM PUERPERAL SEPTICEMIA AND SCARLET FEVER IN VARIOUS COUNTRIES (9-10)

COUNTRY	DEATHS FROM PUERPERAL SEPTICEMIA PER 10,000 LIVE BIRTHS					DEATH RATE FROM SCARLET FEVER PER 100,000 POPULATION		
	1921	1922	1923	1924	1925	1901-1905	1911-1915	1921-1925
Australia	15	14	17	20	17	7	3	3
Belgium	24	21	29	31	28	42	46	14
Canada (birth reg. area)	11	11	18	17	17	41	19	16 (Ont.)
Chile	24	22	19	13	15	5	3	3
Czechoslovakia	--	12	15	12	14			
Denmark	13	9	10	9	9			
England and Wales	14	14	13	14	16	39	21	11
Germany	28	28	30	29	26	62	38	7
Hungary	13	13	13	15	14	189	162	70
Irish Free State	--	--	19	16	17			
Northern Ireland	--	19	16	15	16	15	29	9 (Ireland)
Japan	13	12	13	13	10			
The Netherlands*	7	7	6	7	9	8	7	3
New Zealand	17	18	19	19	15	16	5	3
Norway	8	7	7	6	--	14	11	1
Salvador	10	11	10	8	9			
Scotland	20	20	19	17	16	27	43	27
Spain	32	32	28	27	--	34	24	16
Sweden	13	11	--	--	--	28	16	9
Switzerland	31	25	22	16	20	17	8	3
Uruguay	19	16	17	16	15	28	2	1
U. S. birth registra- tion area	27	24	25	24	24		8.9-3.6	5.3-2.7

*Prior to 1924 live-born infants who died before registration of birth (within three days of birth) are omitted in calculating the maternal mortality rate.

ress toward prevention is to be noticed with reference to erysipelas as applied to both whites and negroes. This trend downward is doubtless due to better quarantine regulations and other means of prevention. This same improvement is not noticeable with reference to puerperal septicemia. There is some downward trend shown in Table I, but this is a rate per 100,000 population and is in part at least accounted for by a diminution in the birth rate. The same improvement is not noticeable in tables based on the rate for living births for either the United States or other countries (Tables II and III).

One cannot but wonder why there should be no material reduction in the mortality from puerperal sepsis along with the general improve-

ment in health conditions and the lessened mortality from other streptococcic diseases. Is it because there has been no general improvement in obstetric care? Can it be possible that such infection has been reduced to the lowest possible level? Are there perhaps some factors which are being overlooked?

It seems to be true that the negroes have a relatively high natural immunity to scarlet fever and erysipelas as compared with the whites. This does not seem to be true with reference to puerperal sepsis. Do

TABLE III. DEATH RATE FROM PUERPERAL CAUSES PER 1,000 LIVE BIRTHS, WHITE AND COLORED, BY STATES AND YEARS (8)

	PUERPERAL SEPTICEMIA						OTHER PUERPERAL CAUSES					
	1919	1920	1921	1922	1923	1924	1919	1920	1921	1922	1923	1924
Kentucky												
White	3.2	2.5	2.6	2.4	2.2	2.5	3.8	3.5	3.0	3.0	3.3	3.2
Colored	6.0	7.0	7.0	9.4	7.7	7.1	6.4	6.0	7.7	9.1	7.7	6.0
Maryland												
White	2.4	1.8	2.0	1.6	2.0	2.5	5.3	4.8	3.9	3.7	3.4	3.1
Colored	4.0	5.0	3.7	3.6	2.9	5.5	7.5	6.8	5.9	4.8	5.4	4.6
Mississippi												
White	—	—	2.2	1.8	2.1	1.8	—	—	4.9	4.6	4.4	4.7
Colored	—	—	4.0	3.6	3.8	4.0	—	—	8.0	6.5	7.1	8.5
N. Carolina												
White	1.5	1.7	1.4	1.6	1.4	1.6	6.7	6.9	4.7	5.5	5.3	5.0
Colored	2.9	3.1	3.0	2.8	2.6	2.8	8.9	10.1	7.2	7.2	8.1	7.6
S. Carolina												
White	1.8	1.8	1.7	1.8	1.4	2.0	6.0	7.1	6.0	6.8	6.0	5.6
Colored	4.5	3.7	3.4	4.5	2.9	3.2	9.9	11.7	8.4	8.3	9.3	10.9
Virginia												
White	1.5	1.9	1.8	1.6	2.0	1.9	5.1	5.6	3.9	4.3	4.0	3.1
Colored	3.3	3.1	3.5	3.6	3.1	3.1	8.6	8.0	6.4	6.5	7.7	6.9

fewer blacks acquire immunity to streptococcic disease which may be inoculated as in puerperal sepsis or is there a difference in the infecting organism? Perhaps there are a multiplicity of factors which are difficult to determine.

That there is a definite difference between the mortality rates of the two diseases for whites and blacks is shown in Tables I and III, where the rates are compared for puerperal sepsis and scarlet fever among the two races. It is readily seen that the mortality rate from puerperal sepsis is quite uniformly greater in each state for the negroes than for the whites. The reverse is true for scarlet fever, which has a constantly lower mortality rate in every state for the colored than for the white race. In order to bring out a little more clearly some points, Table IV was compiled to show comparative rates for some other acute infectious diseases. The mortality rate of typhoid fever is definitely greater for the negroes than the whites. This is probably due to the greater incidence of this disease from poorer sanitation though the difference in the care and treatment might be a contributory factor. It is further possible that the white race might have a greater natural immunity to this disease. Measles present a varied picture and show

no constant difference in the rates, indicating probably that there is no racial immunity to this disease. The comparison of measles and scarlet fever is important because it points to the fact that the exanthemas are not overlooked in the colored race. At least measles are quite definitely diagnosed as a cause of death among negroes in as great frequency as in the whites. It is unlikely that erysipelas as a cause of death would be frequently overlooked and yet the mortality rate is definitely lower for the negroes than for the whites, as is shown in Table I. It seems to be true that statistically at least the colored race has a greater resistance to two of the streptococcic diseases than the white race of the United States.

TABLE IV. CRUDE MORTALITY RATES FROM TYPHOID, MEASLES, SCARLET FEVER, PUERPERAL SEPTICEMIA, AND OTHER PUERPERAL CAUSES (8)

YEAR	CRUDE RATES PER 100,000 POPULATION						CRUDE RATES PER 100,000 FEMALE POPULATION			
	TYPHOID		MEASLES		SCARLET FEVER		PUERPERAL SEPTICEMIA		OTHER PUERPERAL CAUSES	
	WHITE	COLORED	WHITE	COLORED	WHITE	COLORED	WHITE	COLORED	WHITE	COLORED
1920	6.6	19.7	9.3	4.1	5.0	0.8	12.4	23.0	23.6	43.6
1921	7.7	22.6	4.3	3.4	5.8	1.1	12.8	23.3	18.7	37.0
1922	5.7	20.2	4.7	3.0	3.9	0.8	10.5	20.7	18.4	35.9
1923	5.4	17.9	10.5	15.7	3.8	1.0	10.9	20.9	17.7	38.0
1924	4.9	21.8	7.1	14.7	3.4	0.7	10.5	22.5	17.1	42.5
1925	6.0	25.8	2.4	1.9	2.9	0.8	9.9	22.5	16.4	41.9

The greater incidence and higher rate for puerperal septicemia among the blacks are equally apparent and are accompanied by a disproportionately, even higher mortality rate from other puerperal causes. This of course indicates that they have a higher percentage incidence of obstetric complications or that they receive poorer care, both of which are probably true. It is unlikely that deaths among the colored would be more completely and accurately reported than those among the whites. Table V shows practically the same data as Table IV, except that the actual number of deaths is given as well as the rate per 100,000 females.

In a recent discussion of puerperal infection before the American Gynecological Society, Dr. C. Jeff Miller was of the opinion that the pure black was a better surgical risk and withstood infection better than the whites, but that the mulatto was a poorer risk. Dr. J. W. Williams reported some recent work from the Johns Hopkins Clinic indicating that puerperal infection is about twice as frequent in the negroes as in the whites. They have also made the observation that the whites are more susceptible to the hemolytic streptococcus and less to the anaerobic nonhemolytic to which the negro seems much more susceptible. If correct, this could explain the greater resistance of the blacks to scarlet fever and their increased susceptibility to puerperal infection with the anaerobic nonhemolytic streptococcus, with which variety they seem to be more frequently infected.

TABLE V. PUERPERAL MORTALITY RATES PER 100,000 FEMALE POPULATION FOR WHITE AND COLORED PERSONS, U. S. A. DEATH REGISTRATION AREA, 1920-1925 (8)

YEAR	PUERPERAL SEPTICEMIA						OTHER PUERPERAL CAUSES					
	NUMBER ALL AGES			CRUDE RATE PER 100,000 FEMALE POPULATION			NUMBER ALL AGES			CRUDE RATE PER 100,000 FEMALE POPULATION		
	TOTAL	WHITE	COLORED	TOTAL	WHITE	COLORED	TOTAL	WHITE	COLORED	TOTAL	WHITE	COLORED
1920	5800	4984	816	13.3	12.4	23.0	10,976	9334	1642	25.3	23.6	43.6
1921	5881	5048	833	13.7	12.8	23.3	8,681	7356	1325	20.2	18.7	37.0
1922	4928	4180	748	11.3	10.5	20.7	8,626	7331	1295	19.8	18.4	35.9
1923	5156	4397	759	11.7	10.9	20.9	8,549	7164	1385	19.4	17.7	38.0
1924	5134	4305	829	11.5	10.5	20.7	8,589	7022	1567	19.2	17.1	42.5
1925	5018	4172	846	10.9	9.9	22.5	8,463	6888	1575	18.5	16.4	41.9

One might conclude from a consideration of Tables I to V that there has been a downward trend of some diseases which may be considered as due to infection with the streptococcus. This is quite definitely shown statistically in Table I for scarlet fever and erysipelas. In Table I there is an apparent decrease in the mortality from puerperal septicemia per 100,000 population, which also appears in Table IV per 100,000 female population. This decrease is not so apparent in Tables II and III where the rate is based on live births. One reason for this would be that the number of births has been rather rapidly decreasing. In any case the decrease in mortality from puerperal septicemia has been very slight as compared with erysipelas and scarlet fever, especially the latter. One is struck by certain racial differences when comparing the mortality rates of the whites and blacks from certain diseases. This appears very definitely in Table I. It is interesting to note the striking differences in scarlet fever; the rate has steadily decreased for both races but has retained about the same ratio, always being much less for the negro. The same is true with reference to erysipelas, though the difference in the rates is not so striking. The exact opposite holds true with reference to puerperal septicemia, which has a constantly and more or less uniformly higher rate among the blacks than the whites. There has been a slight proportional decrease in this rate for both races. One might ask if this were due to a difference in the resistance of the two races or to greater exposure to infection of the negroes, from either poorer care or more frequent complications. In Tables III and IV it is easily seen that the mortality rate is much higher among the negroes from other puerperal causes, which of course includes some other infections than puerperal septicemia. This points probably to more complications and poorer obstetric care. In Table III one sees in all the states uniformly higher rates for the blacks than the whites, indicating that it is not a local or accidental condition. In Table IV certain other diseases are compared and indicate racial susceptibility or the existence of conditions more favorable to infection. In Table II an attempt is made to ascertain whether or not there is any association between a high rate for puerperal septicemia and one for scarlet fever. In comparing these mortality rates for different countries there seems to be no constant relationship. Belgium, Germany, and Spain show rather high rates for both puerperal septicemia and scarlet fever. On the other hand, The Netherlands and Norway show low rates for both diseases. Australia and Chile show low rates for scarlatina and a moderately low one for puerperal septicemia. There does not seem to be the same tendency in the white race to have a low mortality rate for scarlet fever associated with a high rate for puerperal septicemia. In Table V the same comparative points are brought out with reference to puerperal deaths among the white and

colored races, and in addition the actual number of deaths is given so that one may obtain some idea of the number of persons involved.

It is desirable to secure if possible more definite information as to whether or not a resistance may be built up against puerperal septicemia of streptococcic origin. Scarlet fever, inasmuch as it seems to be a streptococcic disease which establishes immunity to subsequent attacks, might build up such a resistance.

It seemed of some importance to analyze a large group of puerperal cases with reference to the incidence of scarlet fever and the relationship to febrile puerperia and to fatal cases of puerperal septicemia. We have analyzed two such groups of cases, one consisting of over 6000 cases from the Minneapolis General Hospital and the other from private practice, made up of 2000 cases. This makes a combined series of over 8000 cases. In the Minneapolis General Hospital group of 6060 cases, there were 723 cases with a history of scarlet fever, or a percentage incidence of 11.9. In the private series of 2000 this disease occurred in 380 instances, or 19 per cent. This totals 1103 cases, or 13.6 per cent, for the entire series. The general incidence of scarlet fever seems to be between 11 and 12 per cent. The figures and percentages for those not having scarlet fever represent the difference and appear in Table VI. This table also shows an analysis of the febrile and afebrile cases in both those with and without a history of scarlatina. A temperature of 100.4° F. or more on two or more days during the puerperium was taken as the standard of a febrile puerperium. Percentages and rates were computed for each group and subgroup on the basis of the total number of cases and also of those in each subgroup. It is interesting to note that a very much higher percentage of cases without scarlet fever had a febrile puerperium than of those who had a history of this disease. This is marked in both groups of cases as well as in the entire series. In this same table the cases are also divided into afebrile and febrile groups and each of these is subdivided into those with and without a history of scarlet fever. The percentages were figured on the same basis as has been described. We find a higher percentage incidence of febrile puerperia among those without scarlet fever than corresponds to the general incidence of this disease. In the Minneapolis General Hospital group 88 per cent had no history of scarlet fever but over 90 per cent of the febrile cases fall in this group. The same is true in the private series of cases, but more marked, as the relative percentages were 81 and 92. For the entire series, then, the percentage incidence of cases without scarlet fever was 86.3 and the percentage of febrile cases in this whole group was 90.7. The reverse is true for those who had scarlet fever. This seems to indicate that a greater percentage of cases have a febrile puerperium in those who have not had scarlatina than in those who have had the disease.

TABLE VI. ANALYSIS OF CASES SHOWING RELATION OF FEBRILE PUERPERIUM TO INCIDENCE OF SCARLET FEVER

	WITH SCARLET FEVER						WITHOUT SCARLET FEVER					
	AFEBRILE			FEBRILE			AFEBRILE ¹			FEBRILE		
	NO.	RATE ¹		NO.	RATE		NO.	RATE		NO.	RATE	
		NO.	RATE		NO.	RATE		NO.	RATE		NO.	RATE
M.G.II. ² 6060	651	10.8 90.0		72	1.1 10.0		4668	77.0 87.5		669	11.0 12.5	88.0 100.0
Private 2000	363	18.15 95.5		17	0.85 4.5		1422	71.1 87.8		198	9.9 12.2	81.0 100.0
Combined 8060	1014	12.5 91.9		89	1.14 8.1		6090	75.5 87.5		867	10.7 12.5	86.3 100.0
	AFEBRILE						FEBRILE					
	WITH SCARLET			WITHOUT SCARLET			WITH SCARLET			WITHOUT SCARLET		
	NO.	RATE		NO.	RATE		NO.	RATE		NO.	RATE	
		NO.	RATE		NO.	RATE		NO.	RATE		NO.	RATE
M.G.II. 6060	651	10.8 12.2		4668	77.0 87.8		72	1.2 9.7		669	11.0 90.3	12.2
Private 2000	363	18.15 20.3		1422	71.1 79.7		17	0.85 8.0		198	9.9 92.0	10.7
Combined 8060	1014	12.5 14.3		6090	75.5 85.7		89	1.1 9.3		867	10.7 90.7	11.8

¹Rate per 100 cases. Upper figure is rate for total cases, lower figure for group cases.
²Minneapolis General Hospital.

In Table VII a study is made of both the febrile and the fatal cases. It is apparent that the rate for febrile cases is definitely higher in those cases who give no history of scarlet fever than in those who have had it. The number and rates are given with reference to fatal cases. All cases who died of any infection in connection with labor or the puerperium are included. Two cases are also incorporated from whom no history was obtainable, as they entered the hospital in a critical condition and died before a complete history could be obtained. Abstracts of the fatal cases are appended so that their character may be better appreciated.

There were 23 in all, of which two are eliminated from the group statistics because of the absence of a history. This leaves 21 cases for closer analysis. Of these cases, two gave a history of scarlet fever, Cases 5 and 22. The former had a pyelitis and probably a puerperal sepsis. The records of bacteriologic study are incomplete and no autopsy was permitted. The other case was a preeclamptic who had evidence of a respiratory tract infection at the time of delivery and died later of a lobar pneumonia. Of the ten cases with known streptococcic infections, not one gave a history of having had scarlet fever. It would appear, then, that scarlet fever might confer some immunity to subsequent infection with streptococcus during the puerperium. In considering the prevention of puerperal septicemia the various antiseptic and aseptic technics have been used with success in limiting puerperal infections. Bacteriologic studies have been made to determine the various organisms responsible for this condition. There still remains a residuum of cases which become infected and die from puerperal sepsis. Perhaps we can improve our morbidity and mortality rates by more extensive investigation of the factors in the resistance to disease. As pointed out earlier in this paper, such investigation has recently been carried out and is still being conducted. Scheyer¹¹ has carried out experiments to determine the part played by the reticulo-endothelial system in combating streptococcic infections. He believes that the cells of this system show that certain individuals have no reaction against streptococcic infections, that others react but have their resistance soon overcome, and lastly, others who perhaps as a result of previous streptococcic infection are immune or very resistant to it. Burt-White¹² has recently reported some work on the skin test for sensitiveness to streptococcic toxin. He reports 100 tested cases, of which twenty-seven were toxin-sensitive and seventy-three were not. Eight, or 30 per cent, of the twenty-seven women had a morbid puerperium. Only two of the seventy-three women exhibited morbid puerperia. He concludes, "women who react positively to intradermal inoculation of scarlatinal toxin are more liable to develop puerperal sepsis than nonreactors."

Hackett made some skin tests on some of our patients at the Minne-

TABLE VII. INCIDENCE OF FEBRILE AND FATAL CASES OF INFECTION WITH AND WITHOUT A HISTORY OF SCARLET FEVER

CASES	FEBRILE CASES						FATAL CASES					
	WITHOUT SCARLET FEVER			WITH SCARLET FEVER			WITHOUT SCARLET FEVER			WITH SCARLET FEVER		
	NO.	FEBRILE	RATE ¹	NO.	FEBRILE	RATE	NO.	RATE	NO.	RATE	NO.	RATE
M.G.H. 6060	5337	669	11.0 12.53	723	72	1.2 9.95	16	0.39 2.38	1	0.14 1.4	19 17(2)	0.31 2.29
Private 2000	1620	198	9.9 12.22	380	17	0.85 4.5	3	0.18 1.51	1	0.27 5.8	4	0.2 1.86
Combined 8060	6957	867	10.7 12.5	1103	89	1.1 8.1	19	0.27 2.19	2	0.18 2.25	23 21(2)	0.21 2.2

¹Rate per 100 cases. Upper figure is rate for total cases, lower figure for group cases.

apolis General Hospital and found among 161 patients sixteen questionable, 102 negative, and forty-three positive reactions to streptococcic or scarlatinal toxin. Of the 145 cases reacting definitely, 29 per cent were toxin-sensitive. There was a positive history of scarlet fever in twenty-one of the 145 cases, or 14.5 per cent. Fifteen were in the nonreacting group, a percentage of 10.3 of the whole series and of 14.7 of the group. Six were toxin-sensitive, a percentage of 4.2 for the series and of 13.9 for the group. Among the sensitive cases there were six with a febrile puerperium, which is a percentage of 4.2 for the series and 13.9 for the group. In the nonreacting group, thirteen had a febrile puerperium, which makes 9 per cent of the total and 12.7 per cent for the group. There were no fatalities from infection in this series.

This is a small series and it is impossible to draw any conclusions, but a slightly smaller percentage of the nonreacting cases showed some evidence of infection in the puerperium. The incidence of scarlet fever is somewhat higher than in our larger series of cases. A percentage of 71 of those having had scarlet fever showed negative skin reaction and 29 per cent had a positive reaction.

SUMMARY

There has been a downward trend in the mortality of certain streptococcic diseases. This is not true of puerperal septicemia, which is most commonly due to the streptococcus. We should not regard this with equanimity and feel that the minimum has been reached. Bacteriologic studies have been made and the virulence of organisms studied. Various antiseptic and aseptic technics have been applied. Many operative procedures have been recommended and tried. There still remains a residuum of infection sometimes fatal, often unaccountable. We cannot always avoid the possibility of accidental and unknown inoculation of the patient with streptococci and other pathogenic organisms. It is unavoidable that the genital tract be injured and its resistance to infection thereby lowered during parturition. Is it possible perhaps to determine in a measure the resistance of the patient to the more frequent and serious streptococcic infections and perhaps in some manner raise the resistance of those who are sensitive and presumably nonresistant to this type of infection? Certain individuals and races seem to have greater resistance to streptococcic infections than others. This is shown by a comparison of the mortality rates for the negro and the white from certain streptococcic diseases. The fatalities among negroes are greater than for the whites in puerperal sepsis and other puerperal causes. This may be due to poorer care, more complications, or possibly a varying susceptibility to different types of organisms. In a study of a series of cases it appears to be true that those who have had a previous infection with the streptococcus, as in scarlet fever,

are less liable to a morbid puerperium. It also seems to be indicated that a large percentage of those who die from puerperal septicemia do not seem to have had a history of scarlet fever and thus have had no opportunity to increase their resistance. So far as the skin test with streptococcic toxin is concerned, the majority of persons seems to be nonreacting, some of whom have had scarlet fever. Those who are not sensitive may be less prone to streptococcic infection.

CONCLUSIONS

1. In our attempts to curtail and if possible eliminate puerperal septicemia we should gain a clearer idea of the factors producing susceptibility and resistance to infection, especially with the streptococcus.

2. The relationship between streptococcic diseases and puerperal sepsis should be more clearly understood.

3. Natural and acquired immunity should be studied with reference to puerperal infection.

4. It is possible that the streptococcic toxin may afford us an index of the susceptibility of the patient to streptococcic infection.

5. It is also likely that one could build up the patient's immunity to streptococcic infection when this seems to be indicated in susceptible persons.

6. The relatively low incidence of scarlet fever and high rate of puerperal sepsis among the negroes could also be explained by the supposition that at an early age they were resistant to scarlet fever and that later in life they lost this relative immunity and had acquired no group immunity to streptococcic infections from having had scarlet fever and therefore were more susceptible to inoculation with the streptococcus.

7. As an incidental observation it might be noted that while the negro seems more resistant to certain known streptococcic diseases than the white, he seems to have about the same susceptibility to measles. This might suggest the possibility that measles is not a streptococcic disease.

N. B. We wish to acknowledge the helpful suggestions of Dr. W. P. Larson in the preparation of this material.

REFERENCES

- (1) *Hofbauer, J.*: Bull. Johns Hopkins Hosp. 38: 255-277, April, 1926.
- (2) *Findley, P.*: AM. J. OBST. & GYN. 13: 514-517, April, 1927.
- (3) *Bloomfield, A. L.*: California & West. Med. 38: 477-482, April, 1928.
- (4) *Geller, F. C.*: Arch. f. Gynäk. 134: 141-144, 1928.
- (5) The Rise and Fall of Disease in Illinois, State Dept. of Health, 1: 1927.
- (6) The Notifiable Diseases. Prevalence in States. 1925, Reprint No. 1132, and 1926, No. 26, Public Health Reports, U. S. Public Health Service.
- (7) *Doull, J. A., Ferreira, M. J., and Parreiras, D.*: J. Prev. Med. 1: 503-512, November, 1927.
- (8) Mortality Statistics, Bureau of Census.
- (9) *Aperecu de la Demographie des Divers Pays du Monde. L'Institut International de Statistique, 1927.*
- (10) *Gore, J. K.*: A World's War Against Disease. Prudential Insurance Co. of America. Twenty-first Annual Convention, 1927.
- (11) *Scheyer, H. E.*: Virchow's Arch. f. path. Anat. u. Physiol. 266: 255-267, 1927.
- (12) *Burt-White, H.*: Brit. Med. J., London 3518: 974-976, June, 1928.

THE VAGINAL APPROACH FOR CERTAIN INTRA-PERITONEAL OPERATIONS*

BY W. WAYNE BABCOCK, M.D., PHILADELPHIA, PA.

(Chief of the Surgical Service, Samaritan Hospital)

WITH a choice of several operative procedures a surgeon is prone to choose the method with which he is most familiar. Few operators are truly eclectic, most are guided by personal convenience, previous training and usage and often are unduly prejudiced by a single unfortunate experience.

The vaginal section has never been popularized despite the enthusiasts who have urged the advantage of the method. Especially through the nulliparous or atrophic vagina, access is difficult; vision is restricted and considerable experience desirable before any but the simplest type of drainage incision is made. To increase the exposure by a Schuchardt or Staude incision is only rarely warranted, and it is not surprising that the surgeon turns to an anterior abdominal section as a routine measure after having once experienced the difficulties of the vaginal route. Nevertheless, there are conditions in which the vaginal section gives a lower mortality and morbidity than an incision through the anterior abdominal wall and in which the access to the field of operation is more direct and at least not more difficult than by an anterior abdominal section. Therefore, it behooves every abdominal surgeon to study the method of approach to the peritoneum through the vagina and to acquire a degree of skill in this operation by training. Particularly for the obese patient with a relaxed or lacerated outlet does vaginal section commend itself for operations within the pelvis. Here it has the disadvantage of permitting but limited exploration of the abdominal structures above the pelvic brim. However, even delicate conservative operations upon the uterus, tubes or ovaries, the shortening of uterine ligaments, operations upon the rectum, pelvic colon, lower ureters and not infrequently the appendix and small intestine, may be carried out and often with greater facility than through a thick abdominal wall.

At this time it is not desired to consider the usual vaginoperitoneal operations for displacement, inflammatory disease or newgrowths of the uterus and adnexa but rather to indicate the occasional value of the vaginal approach in operating for affections of the peritoneum, intestine, appendix, lower ureters and base of the bladder.

For the operations requiring dependent drainage or the greatest possible exposure and for operations upon the rectum, intestine and

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont. September 10-12, 1928.

appendix, the posterior colpotomy is to be preferred. For operations upon the base of the bladder, ureters, and for conservative operations upon the uterine ligaments and adnexa, an anterior colpotomy gives more direct access.

Peritoneal and Pelvic Infection.—The relatively greater resistance of the pelvic peritoneum to infection, the dependent drainage and the comparative immunity of the peritoneum, if irrigation is not used, from infection spreading upward from the external genital tract after a vaginal section, renders this route the preferred method of drainage for all acute infections that may be reached through the pelvis. Doubtless an important factor in the good results obtained is the very limited peritoneal irritation from exposure to the air, handling or other manipulation. Not only may many acute infections originating from the genital tract be handled best through the vagina, but certain infections involving or adjacent to the pelvis, originating in the appendix, rectum, colon or low-lying intestinal coils, may be treated with the lowest mortality this way. After perforation of the uterus, rectum or pelvic colon, the ureter or base of the bladder, an occlusion and drainage can be obtained through a vaginal section. Ureteral and intestinal openings drained through the vault of the vagina usually close spontaneously, at least if there is no obstruction below the opening. Where a low-lying intestinal coil has been severely damaged or partially separated from the mesentery, isolation of the injured area by iodoform gauze introduced through the vagina, although often followed by a vaginal intestinal fistula, is not infrequently succeeded by spontaneous closure in quite a surprising manner. As compared with the danger of general peritoneal infection from operations upon the lower intestine performed through the anterior abdominal wall, the vaginal route is relatively safe from infection.

Evacuation of Peritoneal Effusions.—Serum, blood or pus may be given exit from the peritoneal cavity by a posterior colpotomy and gauze drainage. For ascites a longer and more complete discharge of serum may be obtained than from an incision through the anterior abdominal wall. The drainage of the general abdominal cavity, however, is soon interrupted by the formation of adhesions. The vaginal incision is very useful for the removal of blood which often continues to come away for hours and days after the incision is made. The limited manipulation required is a great advantage where there is shock or collapse. In ectopic pregnancy or tubal abortion with much intraabdominal hemorrhage, the vaginal approach is often simple, rapid and relatively safe; all that is required being to pull down, clamp or ligate the affected tube and to introduce a large gauze drain into the culdesac. The operation may be completed in five or ten minutes and causes less shock than an anterior abdominal section. I have used this method in all tragic types of ectopic pregnancy for over twenty

years, the only death in the series being from a pulmonary complication three weeks after the operation. Normal pregnancies have occurred after this operation.

In certain cases of rupture of the lower segment of the uterus during labor, the uterine laceration may best be closed, the blood and possibly the placenta removed from the abdomen and drainage instituted through the vaginal opening.

Vaginal Enterostomy.—In an acute postoperative obstruction following celiotomy for pelvic disease the point of obstruction is usually within the pelvis. Often the operation has involved the separation of adhesions or the opening of septic foci. The condition may be due to a paresis of the traumatized bowel, to adhesions or to secondary gaseous distention producing a kink and obstruction. If the abdominal incision is reopened and the adhesions are separated, they will often reform with a continuance or recurrence of the ileus. At times repeated operations are done in the effort to relieve the patient. If, however, a vent is given to the distended intestine by a properly placed enterostomy, not only is temporary relief obtained, but an obstruction due to recent adhesions, pressure, or angulation of the intestine usually spontaneously disappears. Occasionally in such a form of obstruction, particularly where a bimanual examination shows the presence of distended intestine in the pelvis, a vaginal enterostomy gives immediate relief and is very efficient.

With the pelvis well elevated an incision is made through the posterior vaginal culdesac, the distended loop of gut exposed, isolated by gauze, a purse-string suture introduced, the enterostomy formed by a soft rubber tube of sufficient size around which the purse-string suture is securely tied. The tube is then brought out through the vagina and separated from adjacent structures by iodoform gauze packing. The operation affords drainage of the pelvis and is not complicated by the extrusion of intestine as often occurs when the anterior abdominal wall is incised. Not infrequently the incision also gives exit to septic or bloody fluid in the pelvis.

Carcinoma of the Rectum.—The Schuchardt unilateral or the Staude bilateral incisions are of great value in the complete removal of the rectum for carcinoma. Usually the operation forms the second stage after a previous suprapubic mobilization of the colon and a colostomy. The vaginal section enables the evacuation of the posterior part of the pelvis and the free excision of infiltrated vaginal or uterine tissue.

Ureter.—The lower end of the ureter is best exposed through an anterior or anterolateral vaginal colpotomy. With the posterior vaginal wall well retracted, the cervix is grasped by a vulsellum forceps and pulled toward the tip of the coccyx, the anterior vaginal wall divided transversely one centimeter anterior to the angle of reflexion of the bladder, the bladder demonstrated and carried forward

and the peritoneum opened. The edge of the peritoneal incision is fastened to the anterior edge of the vaginal incision by several interrupted sutures. The ureter is located in one of three ways as follows: (1) *By inspection*. Elevating the anterior margin of the incision the exposed fold of bladder is traced laterally where it is continuous with the ureter which passes into the adjacent parametrium. The ureter may then be brought down into the vagina by an appropriate blunt hook or nontraumatizing forceps. The ureter is recognized by the characteristic intermittent sliding or trombone peristaltic waves which are intensified by stroking the tube. (2) *By palpation*. The ureter, especially if thickened, dilated or containing a calculus or other foreign body, may be detected by the finger passed through the colpotomy wound. (3) *By ureteral catheter*. A ureter containing a sound or catheter may be readily located by palpation through the colpotomy wound.

Operations performed upon the ureter through the vagina include: (a) drainage for perforation or injury of the ureter; (b) ureterotomy for the removal of calculus or other foreign body; (c) the completion of a combined operation of ureterectomy for tuberculosis or other disease, the upper part of the ureter having previously been liberated by an incision of the abdominal wall; (d) the occlusion or implantation into the bladder of a supernumerary ureter causing a leakage of urine. (e) ureterovesical or ureterointestinal anastomosis. For the lateral anastomosis of the ureter to the bladder I have used a simple ligature method after the plan of McGraw's ligature method of gastroenterostomy, except that elastic traction was used instead of an elastic ligature. Contiguous portions of the ureter and bladder are transfixed by a fine curved needle carrying a strong linen or silk ligature which is then tightly tied to cause a pressure necrosis of the adjacent walls of the ureter and bladder and the formation of a new stoma. The ends of the ligature are carried through the bladder and urethra by the aid of a small probe and traction applied by means of a small rubber band fastened by adhesive plaster to the thigh. The urethra is protected from pressure by threading the ligature through a section of rubber catheter. Under the slight but continuous traction the ligature comes away in five to seven days leaving an ample opening into the bladder. The peritoneum should be guarded for forty-eight hours by a small drain of iodoform gauze, although little leakage of urine through the vagina may be expected. (f) The ureter or ureters may be implanted into the sigmoid or pelvic colon by the vaginal route in patients with a fairly capacious vagina. The method of Madl, Peters or Coffey may be used, the loop of bowel being pulled well into the vagina to give convenient access.

In fractures of the pelvis with rupture of the base of the bladder suture and drainage are, at times, feasible through the vagina with a

minimum of shock. Occasionally a portion of the base of the bladder may be resected or otherwise treated for newgrowth or diverticulum through the anterior vaginal wall.

Appendicitis.—In acute appendicitis there are three great dangers: first, the patient's friends who feed and purge the victim; second, the attending physician who delays and does not enforce complete physical and intestinal rest; and third, and not the least, the over-active surgeon. Robert Morris has particularly emphasized the danger of unnecessary and prolonged operations in the presence of peritoneal infection. During the second stage of peritonitis from appendicitis, it is the exposure and damage to peritoneal surfaces during operation which is to be especially feared. By free exposure, by introducing the hands into the abdomen, by manipulation, evisceration, sponging, irrigation, unnecessary suturing, the peritoneum is converted from a protective to an absorbing membrane, and the mortality of diffuse peritonitis from appendicitis rises from 7 to even 85 per cent. For the surgeon so constituted that he cannot withhold his hand in operating for septic forms of appendicitis the vaginal route with its lack of access would be a large protective factor for the patient. Of course no one would advocate vaginal appendectomy as a routine procedure, yet a diffuse purulent peritonitis may be drained and low-lying purulent collection of appendiceal origin may be evacuated by a posterior colpotomy. I have removed the appendix or drained appendiceal abscesses through the vagina about fifteen times, a small proportion of the total number treated. In a number a quiescent appendix was removed through the posterior culdesac in association with other pelvic operations. From this small experience, without mortality, my impression is that when feasible the vaginal route is a relatively safe approach.

With a patient in high Trendelenberg position the appendix is not infrequently seen as the trowels are moved to inspect the various portions of the pelvic cavity. The appendix is pulled down by a sponge forceps, the base doubly ligated and divided, and the meso-appendix tied with the same ligature over the stump. A gauze drain is left through the vaginal opening.

A plea is made for greater familiarity with the forms of colpotomy that the abdominal surgeon may make use of this valuable procedure in the occasional condition for which it is indicated.

1720 SPRUCE STREET.

FACTORS GOVERNING BLOOD LOSS IN THE THIRD STAGE OF LABOR

(A PRELIMINARY REPORT)*

BY L. A. CALKINS, M.D., PH.D., UNIVERSITY, VA.

ONE OF the many unexplained facts in obstetrics is the marked variability in the loss of blood in the third stage of labor. Obviously more definite knowledge of the factors underlying this variation is highly desirable. The present study, of which this paper is merely a preliminary report, contemplates the determination of some of these factors and the laws governing their operation. There were available for this study 868 consecutive deliveries past the thirtieth week. Fifteen of these patients were delivered by cesarean section, leaving 853 cases delivered vaginally and hence suitable for this investigation. The average blood loss in this group of 853 cases was 222 c.c. This average compares very favorably with others published in the literature. DeLee and Hirst each estimate an average of 250 c.c. Williams computed the average of 1000 cases and found it to be 344 c.c. Ahlfeld's average on 2058 cases was 505 c.c. Other averages include those of Champneys (300 c.c.), Tucker (300 c.c.), Commandeur (500 c.c. to 600 c.c.), and Tarnier and Chantreuil (600 c.c. to 700 c.c.).

Not only do the several averages show a considerable variation, but the range of the individual series is also quite variable. Our cases ranged from zero to 1500 c.c. Williams' 1000 cases ranged from zero to 2400 c.c. Ahlfeld reported one case with a loss of 3250 c.c. followed by recovery. This element of variability is so great that we have not had, in the past, a satisfactory definition of what should be regarded as normal loss and what should be looked upon as pathologic. An arbitrary limit of normal has been set by three different writers. DeLee and Hirst place this limit at 500 c.c.; Williams at 600 c.c. Eighty-seven per cent of Williams' cases were under 600 c.c. As far as our series is concerned 600 c.c. would seem to be about the proper limit of normal. Ninety-six per cent of our cases lost less than 600 c.c.

Our technic of measurement of the blood loss is as follows: At the first show of blood, after delivery of the child, a sterile hand basin is placed against the perineum between the vulva and anus. The placenta and associated blood are caught in this basin. The basin is held in place until the active bleeding has been controlled. The blood in the pan is then measured in a graduate and is labeled the measured loss. In the majority of cases there is other bleeding previous to the placental stage, either from laceration or episiotomy, or subsequent to it from imperfect contraction of the uterus, injuries to the birth canal, etc. This amount

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

is estimated, care being taken not to underestimate it. This second portion is called the estimated loss. While theoretically the method employed in arriving at this latter amount is subject to error it is believed to be accurate to 25 c.c. on the average. It was selected in preference to the more accurate method of Williams because of the desire to separate the placental stage blood from other bleeding, as different factors might be involved in the two types. The sum of the measured loss and the estimated loss equals the total loss. Analysis of each of the three values has been made. Williams' method is as follows: "Immediately after the birth of the child a sterile douche pan is placed under the buttocks of the patient where it remains until all bleeding following the birth of the placenta has ceased. The entire amount is then poured into the graduate, accurately measured in cubic centimeters and noted in the history."

Certain types of cases in the series of 853 were found unsuitable for inclusion in an analysis of normal labors (Table I).

TABLE I

	CASES	AVERAGE C.C.
Placenta previa	22	351
Hydramnios, myoma uteri, retained placenta, etc.	5	410
Median (and high) forceps	12	428
Third degree lacerations	3	358

Excluding this group of abnormalities there were 809 cases remaining for analysis (average blood loss 213 c.c.). Of these 533 were white women with an average blood loss of 223 c.c., and 276 were colored women with an average loss of 198 c.c.

Certain other types of abnormalities and complications were included in the analysis because the average blood losses were not materially different from the general average (Table II).

TABLE II

	CASES	AVERAGE C.C.
<i>Slightly More Than Average Blood Loss</i>		
Toxemia of pregnancy	61	261
Deformed pelvis	23	245
Low forceps	53	292
Version, combined podalic	17	232
Breech presentation	31	233
<i>Slightly Less Than Average Blood Loss</i>		
Twin pregnancy	9	203
Syphilis	41	193
Anemia, severe	10	170
Bag, Voorhees'	17	185

Analysis of the 809 cases, including those in Table II, was first made. It was further noted, however, that the type of laceration received has some effect upon blood loss.

First degree laceration	273 cases	199 c.c. average
Second degree laceration	116 cases	240 c.c. average
Episiotomy	72 cases	272 c.c. average

Wishing to eliminate all possibility of the effect of abnormality on the coefficients, a second set of analyses was made on the 516 strictly normal cases. (By strictly normal we mean not more than first degree laceration, no complication, and no operative procedure.) The average blood loss in this group of 516 normal cases was 207 c.c.

Further refinement by classes or groups was not possible because of the small size of the present series, although it was noted that:

Private cases had an average blood loss of 235 c.c.
 White ward cases had an average blood loss of 225 c.c.
 Colored ward cases had an average blood loss of 200 c.c.

Moreover the work of the interne is not negligible. Fourteen consecutive internes, each serving three months, showed:

In the first month an average loss of 238 c.c.
 In the second month an average loss of 223 c.c.
 In the third month an average loss of 211 c.c.

This was in spite of the fact that the resident or a visiting man was present at each delivery.

Pearson's coefficient of correlation has, so far, been used exclusively in these analyses.*

The results of the first series of correlations (on the whole group of 809 cases) are listed in Table III.

TABLE III. CORRELATIONS (ALL CASES)

Age of mother	-0.007 \pm 0.024
Parity	-0.056 \pm 0.024
Length of gestation	+0.140 \pm 0.029
Conjugata vera	+0.062 \pm 0.026
First stage of labor	+0.067 \pm 0.025
Second stage of labor	+0.127 \pm 0.024
Third stage of labor	+0.118 \pm 0.024
Height of mother	+0.119 \pm 0.029
Weight of mother	+0.162 \pm 0.030
Length of baby	+0.180 \pm 0.025

From Table III one might draw the following deductions:

1. The age of the mother has no effect on the blood loss.
2. Parity probably has no effect, as the coefficient, besides being small, is hardly more than twice its probable error.

*Coefficient of correlation (r) = $\frac{\sum xy}{N\sigma_x\sigma_y}$ where x, y are deviants from the mean of X, Y ; N is the number of cases, and $\sigma_x\sigma_y$ are the standard deviations of the means of X, Y . This coefficient is very satisfactory because of its applicability to partially correlated biologic phenomena. When the two variables are perfectly proportional to each other, the coefficient is plus 1.0; when they bear no relation, one to another, the coefficient is 0.0; and when they are in perfect inverse proportion to one another, the coefficient is minus 1.0. Any value between zero and plus 1.0 indicates a direct proportion correlation, and any value between zero and minus 1.0 indicates an inverse proportion correlation. It is very rare in biologic phenomena to find correlations greater than plus 0.5 or minus 0.5.

3. Length of gestation beyond the thirtieth week has a definite though small effect, as the coefficient is more than four times its probable error. This coefficient is, however, smaller than that for the length of the baby, and so the effect of the length of gestation is to be explained on the basis of a coexistent increase in height of the child.

4. The size of the pelvis has but little if any effect on the blood loss. The coefficient is only slightly more than twice its probable error. The same seems to be true of the length of the first stage of labor.

5. The length of the second and third stages of labor would seem to have some effect on the blood loss, as their coefficients are more than four times the probable errors. The same might be said of the height of the mother.

6. The weight of the mother shows a larger coefficient, more than five times its probable error, and shows a definite effect in direct proportion on the blood loss.

7. The size of the child seems to be the most important factor of this group, affecting the blood loss in direct proportion.

When we come to the consideration of the coefficients for the series of 516 normal cases we find in Table IV:

TABLE IV. CORRELATIONS (NORMAL CASES ONLY)

First stage of labor	+0.101 \pm 0.032
Second stage of labor	+0.060 \pm 0.032
Third stage of labor	+0.070 \pm 0.032
Height of mother	+0.109 \pm 0.037
Weight of mother	+0.130 \pm 0.040
Length of baby	+0.139 \pm 0.032

1. The length of the first stage of labor appears of more importance than that of the second or third stage but none of them are particularly significant.

2. The height and the weight of the mother still show coefficients of about the same magnitude, but because of the small size of this series their probable errors are larger, and their significance must remain somewhat in doubt until a larger series can be analyzed.

3. The length of the baby has a coefficient which is more than four times its probable error. This coefficient must, therefore, be regarded as significant.

Determination of the coefficients for the component parts of the total blood loss shows a rather significant result in Table V.

Very evidently the measured loss is the part affected both by the size of the baby and weight of the mother.

None of the above factors show a marked effect on the blood loss. Several of them seem to have a small effect. Analysis of a series of at least 4000 cases will reduce the probable errors to such a point that more definite conclusions can be drawn. Further search for other fac-

tors such as the size and weight of the placenta, blood volume of the mother, coagulation elements of the mother's blood, and blood pressure, must be made.

TABLE V. CORRELATIONS (NORMAL CASES ONLY)

Total blood: Length of baby	+0.139 \pm 0.032
Measured blood: Length of baby	+0.175 \pm 0.133
Estimated blood: Length of baby	+0.075 \pm 0.134
Total blood: Weight of mother	+0.130 \pm 0.040
Measured blood: Weight of mother	+0.144 \pm 0.040
Estimated blood: Weight of mother	+0.001 \pm 0.042

If definite knowledge of the physiology of blood loss can be acquired, it may be possible to determine the etiology and nature of the excessive bleeding in the various types of cases where hemorrhage so frequently occurs.

At this point in the study the following conclusions seem justified:

1. Pearson's coefficient of correlation affords an excellent medium for this type of investigation.
2. Age of the mother has no effect on the blood loss at delivery. Parity has little or no effect.
3. There is a direct proportion between the length of the baby and the blood loss (most marked in the measured loss). This effect is definite but not large.
4. The height and weight of the mother probably affect the blood loss in direct proportion.
5. No one of the factors studied exerts a major effect on the blood loss. Further decrease in this amount must, therefore, come through improved management of the third stage.

REFERENCES

Ahlfeld: Die Blutung bei der Geburt und ihre Folgen für die Frau. *Ztschr. f. Geburtsh. u. Gynäk.* 51: 341, 1904. *Freeland*: The Relationship Existing Between the Mechanism and Management of the Third Stage of Labor—2600 Cases From the Rotunda Hospital, Dublin, Ire. *Tr. Am. Assoc. Obst. and Gynec.* 26: 448, 1913 and 1914. *Polak, J. O.*: A Study of the Management of the Placental Stage of Labor, *Surg. Gynec. Obst.* 21: 590, 1915. *Tucker*: Birth of the Secundines, *Am. J. Obst. & Dis. Women* 12: 569, 767, 1898. *Williams, J. W.*: Tolerance of Freshly Delivered Women to Excessive Loss of Blood, *Am. J. Obst. & Dis. Women* 80: 1, 1919; Contributions to Medical and Biological Research, Paul Hoeber, New York 2: 1238, 1919.

THE TEACHING OF OPERATIVE OBSTETRICS*

By A. M. MENDENHALL, M.D., INDIANAPOLIS, IND.

DURING the last few years the writer has been greatly interested in the number and variety of articles in the literature on obstetric mortality and morbidity. Comparatively few journals on obstetrics or on medicine in general are being published which do not contain someone's view as to the cause of our glaring failures.

Articles on needless obstetric operations, improperly chosen operations, unskillfully performed operations, poor training in obstetrics, high maternal and fetal death rate, etc., are appearing regularly and frequently.

A very careful collection and study of these essays reveal a great deal of destructive and but little constructive criticism. They give us a carefully developed diagnosis with but little or no suggestions as to treatment. We all must admit there are many causes contributing to our very undesirable rank among civilized nations in our obstetric results. We all admit that the remedy is not to be found in the solution of any one problem. There can be no doubt that the midwife as she exists in America is a menace. Very few of our schools have given obstetrics a proper rating in the curriculum. Many schools are poorly equipped to teach obstetrics. The laity is poorly informed as to the importance of child bearing. It is possible that some of our high ranking obstetricians are teaching major obstetric surgery in a way that misleads and misguides the poorly trained obstetric attendant.

The writer is ready to admit that all these factors and many others have a bearing upon the very unsatisfactory progress but wishes to direct attention especially to our present way of teaching operative obstetrics and to suggest some changes.

Many authorities have shown that approximately 35 per cent of the young doctor's practice is obstetrics, whereas only about 4 per cent of the four years' course in medicine is allotted to the obstetric department.

On the other hand surgery which will be represented by about 5 to 10 per cent of the recent graduate's time, is given 18 per cent (exclusive of the surgical specialties) of the teaching hours. We all realize furthermore that almost all the general surgery coming to the young physician is minor in type.

Yet this same young physician is presumed to be competent to do at least all ordinary obstetric operations.

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1923.

The Committee on Maternal Welfare has repeatedly given us all these figures and has demanded a remedy.

Many authorities, among them Polak, Newell, E. P. Davis, Lynch, Rowland, and others have insisted that the general practitioners are doing too much obstetric surgery.

The Committee on Maternal Welfare says: "It is not expected that the general practitioner shall do cesareans and other obstetric operations," but the writer maintains that he *is* doing far too much operative obstetrics. The young doctor may not often be doing cesareans, but he is quite generally doing forceps deliveries, internal podalic versions, craniotomies, episiotomies, third degree repairs, and in fact ordinary perineorrhaphies, and has only an inadequate training.

A few years ago the writer investigated the obstetric departments of a number of our leading schools and found that most of the teachers admitted that comparatively few of their students ever assisted at a forceps delivery.¹

Is our teaching correct in this respect? Is it right that we should deliver a few high sounding lectures on the history and development of the obstetric forceps and describe and display the various types of instruments and their different locks and parts? Is it right that we should didactically orate on the indications and contraindications and manner of applications without these well-delivered lectures being supplemented by opportunities for the student to develop his ability to use an instrument which is fraught with so much danger?

There will be some who suggest the manikin. We accept the manikin as a very great addition to our teaching armamentarium, but it falls far short of a demonstration on the living patient.

A great deal can and must be taught by individual instruction in the many obstetric procedures on the manikin, but this is only an introduction and should be used to lead up to the same operations upon the living patient.

There is a very important place in our curriculum for manikin demonstration, and in many schools it is being used very advantageously, but it can never be a substitute for the woman in labor.

Teaching operative obstetrics from the lecturer's platform is apt to leave the student under the impression that obstetric surgery is simple and easy.

At least we are confronted with the fact that the average neophyte in medicine has little hesitancy in attempting any ordinary obstetric operation without assistance and often in the patient's home, using any available woman or other layman as an anesthetist.

Are we properly dignifying obstetric surgery? We have all had much to say in recent years about obtaining proper recognition for the general subject of obstetrics. Most of us feel that there should be three and only three major departments in our medical schools—*medi-*

cine, obstetrics, surgery. We have advocated this in many ways and have sometimes gained ground, although just now there seem to be some obstacles to progress.

It must be admitted that before we can hope to give a thorough practical course in operative obstetrics to undergraduate students, we must have much more time allotted to us in the curriculum and much more and better clinical facilities than the average school possesses.

We cannot overlook the fact that at present we have none too many hours to teach the physiology of so-called normal pregnancy, labor, and the puerperium.

Our students must be thoroughly drilled in obstetric physiology. They must be carefully taught to distinguish between the normal and the pathologic. They must be instructed in detail as to the value and importance of prenatal care. They must be taught the fundamentals of obstetric pathology and how to recognize and treat the many deviations from normal physiology. And all this requires time. In fact it requires so much of our present number of hours that we have not the time left for a proper teaching of obstetric operations.

Furthermore, very few clinics approach in size the number of cases necessary to teach operative obstetrics to the average sized class. The teaching capacity of an obstetric patient is greatly limited. Not more than one or two students can secure any valuable instruction in an obstetric operation on one patient. Obstetric operations can rarely be scheduled. The student is not always available at the proper time. For these and other reasons it requires a very large number of obstetric patients to secure adequate teaching in obstetric surgery to an average class of students.

A clinical amphitheater is a help, but merely observing obstetric surgery is not enough.

A combination of obstetrics and gynecology under one head makes for better teaching of both subjects. Obstetrics in its modern and broader sense should include all obstetric operations and pelvic surgery. All else should go to the department of general surgery. Normal obstetrics, obstetric operations and pelvic surgery are inseparable. No one can be considered competent in gynecology who is not thoroughly trained in obstetrics, nor is one properly trained in obstetrics who has not the ability to handle all obstetric operations.

Hence from a pedagogical standpoint we should not recognize any independent department of gynecology.

There has been marked progress in the last two decades classifying surgeons. The laity now rather generally demands that some one other than the general practitioner shall be called upon for surgery. The College of Surgeons and other influences have done great good in attempting to ascertain who is competent to do major surgery. A very large part of obstetrics is surgery, and surgery of the greatest impor-

tance. The obstetric surgeon is practically always entrusted with the lives of two patients rather than one.

Shall he be permitted to stumble ahead in this important field with little or no training? Will we continue to permit the laity as well as the young graduate to believe that he is not quite equal to an appendectomy but is able to assume immediate and sole responsibility for major obstetric surgery? Whether the question is answered yes or no, the fact remains that just such a condition exists at this moment, and there seems to be some apathy about finding a remedy.

A recent writer attempts to explain our high fetal and maternal mortality by suggesting two causes.⁸ "Ignorance on the part of the public of the dangers connected with childbirth and the need of skilled care and proper hygiene to prevent them, and the difficulty of securing proper obstetric care—and that the public still regards childbirth as an entirely normal process. This has reacted on the medical profession, producing low fees, so that, with the exception of the city specialist, obstetrics has become the worst paid, although most difficult and exacting branch of medicine."

Newell recently gave us food for much thought when he reported the astounding obstetric mortality in Massachusetts and showed that a large part of it was the result of needless obstetric surgery and the attempt of poorly trained operators to do major obstetric surgery.

The average practitioner is not competent to handle a severe case of postpartum hemorrhage, placenta previa, prolapsed cord, abruptio, or contracted pelvis. He may be and often is able to make a fairly accurate obstetric diagnosis and probably could write a good outline for treatment but will frequently be quite incompetent to carry out the proper obstetric operation.

At present the teaching in surgery and gynecology is mainly to develop the student's ability in diagnosis, while little effort is made to teach operative procedures, since it is not presumed that the new graduate will go out and do major surgery before he takes special training. Only last year our retiring president admitted that our graduates are not properly equipped to do obstetric surgery.

Dr. Polak² says the average graduate is a "fair midwife, nothing more."

Holmes³ says, "The fact that the death rate among emergency cases (that is, those sent in by medical attendants) is over 10 times that of regular applicants in the New York Lying-In Hospital is a reflection on the preliminary medical training of the profession." He further states that the proper place for the study of obstetric surgery is in postgraduate courses intended for those preparing for the specialty. But this latter statement overlooks the fact that a very large number of women are still being delivered by the general practitioner and not

by those specially trained in obstetrics, and that there are comparatively few places where advanced obstetrics can be studied.

The writer in a former paper⁴ advocated more specialists in obstetrics. It would be a distinct advantage if more trained obstetricians were available at least as consultants. We realize it is a great misfortune when the family doctor in need of a consultant is compelled to call a general surgeon. Except for cesarean section alone, the general surgeon is rarely any better obstetrician than the family doctor and usually falls far short of the ability to ascertain the indications and contraindications even for cesarean section. If more trained obstetricians were properly distributed over the country and if the laity and medical profession were cognizant of their ability and availability, they would supply a very definite deficiency and fewer needless and unsuccessful obstetric operations would be performed.

But what are the opportunities for such training? The number of positions available to men who wish to make a special study of obstetrics are still very few. In 1921 it was shown that many men were clamoring for such opportunities,⁵ and the condition has been but little bettered since.

In Sweden a six months' residency in obstetrics is required.

E. P. Davis says, "Of the medical profession the general practitioner is the greatest danger in obstetrics," and that "He must do obstetrics to keep the family and he must do obstetric surgery because his colleagues do."

Stoeckel⁶ reports 55 cases where obstetric operations were instituted in the home and failed. Thirty-nine of these were high forceps and no indication in 37. Twenty-seven babies died; 4 mothers died.

In London the Committee from the Royal Society of Medicine states that "The general practitioner tends to regard himself as an obstetric specialist and feels that to call in a specialist is a confession of weakness or failure." They further state that "meddling through is a prevalent practice and it is legitimate to trace it in some measure to training in practical midwifery." This would seem to indicate that conditions are no better in London than in America.

A recent American writer⁷ says that 10 per cent of our obstetric deaths are the direct result of operations.

Some will say that obstetric surgery must be taught during the intern year. Possibly this is correct, but we meet with at least two difficulties. First, there are a few graduates still who go into practice with little or no internship. Second, a very large number of our so-called acceptable hospitals have but few obstetric cases, and many times these are private cases or are handled by men not trained in obstetrics so that the obstetric service would be of little or no real value to the intern.

Would it be Utopian to hope that obstetrics will attain recognition in the not too distant future when our acceptable hospitals will give a satisfactory service in obstetrics?

But too many of these solutions for the problem are looking far into the future.

The present situation confronts us as follows:

1. Our students are graduating with little worth-while training in obstetric surgery.

2. They are graduating with the feeling that they are able to do obstetric surgery.

3. The laity still believes that the young doctor as well as the old family physician is equipped to do major obstetrics.

4. At present our hospitals are not giving and cannot give satisfactory training to their interns in obstetrics.

5. Not enough trained obstetricians exist in many locations to supply the demand as obstetric consultants.

6. Opportunities for postgraduate study in obstetrics are still not sufficient to supply the demand.

7. The teaching of operative obstetrics in the average school at present is quite unsatisfactory and may often misguide and mislead the student as to the importance of a thorough training in obstetric surgery.

8. Before we can properly teach operative obstetrics, we need more hours in the curriculum, good clinical amphitheatres and much larger obstetric clinics.

9. Shall we continue this unsatisfactory training, or shall we avoid all attempt at teaching major obstetric surgery to the undergraduate and compel him to obtaining this training later?

REFERENCES

- (1) *Mendenhall, A. M.*: AM. J. OBST. & GYNEC. 3: 53, 1922. (2) *Polak, J. O.*: AM. J. OBST. & GYNEC. 15: 295, 1928. (3) *Holmes, R. W.*: AM. J. OBST. & GYNEC. 2: 225, 1921. (4) *Mendenhall, A. M.*: Indianapolis Med. 28: 66, 1925. (5) *Mendenhall, A. M.*: AM. J. OBST. & GYNEC. 1: 849, May, 1921. (6) *Stoeckel*: Monatschr. f. Geburtsh. u. Gynäk. 1926. (7) *Polak, J. O.*: AM. J. OBST. & GYNEC. 15: No. 3, 1928. (8) *Holmes, R. W.*: AM. J. OBST. & GYNEC. 2: 225, 1921.

HUME-MANSUR BUILDING.

PROBLEMS ASSOCIATED WITH THE CERVIX*

By R. R. HUGGINS, M.D., PITTSBURGH, PA.

ONE of the most gratifying things in medicine is the wonderful progress made during the last twenty-five years in the prevention of disease and reduction in mortality. It is rather remarkable that while there has been a satisfactory reduction in the mortality of tuberculosis, there has been a corresponding increase in cancer and little change in puerperal sepsis or the frequency of injuries to the cervix and pelvic floor. The reduction in the mortality of tuberculosis and many other diseases has not been due altogether to the discovery of the active cause of these diseases but to a more intelligent appreciation by both the public and the profession of the underlying influences. For the reason that no definite cause has been assigned to cancer and, because of its frightful mortality, we have been slow, as a profession, in asking the public to share with us the responsibility of more active measures in its prevention.

The physician's office will soon be filled with people who come to consult him with reference to the state of their health rather than wait until sick. They already desire to find out if they are up to their own normal and if their resistance is such that they will be able to withstand the invasion of infecting organisms and the strain incident to the stress of life. In other words, we have entered the period of prevention and it marks a new era in the progress of scientific medicine. It would seem that it is the duty of the members of this organization to teach more actively both the public and the profession that which they know about prevention rather than continue to stress the symptoms of the later stages and the technic of operative measures which often fail either in relief or the saving of life.

For these reasons, the problems of the cervix, as above indicated, should be considered from this standpoint. One is inclined to wonder whether the inaccessibility of the cervix, and its minor and somewhat subservient position to that of the uterus, has not led to a lack of a keen appreciation of some of its problems. When we consider the great amount of inconvenience, suffering and misery, and, finally, death, that grows out of various kinds of disturbances which have their origin in this small area, it would seem that while much has been said and written, there still remains a responsibility among those who are teachers and leaders in gynecologic and obstetric work. It holds an interesting study from the standpoint of anatomy. Here within the

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

short space of one inch are four different kinds of epithelium. Beginning with the squamous cells covering the vaginal portion, we find immediately adjacent within the canal a mucous membrane composed of complicated racemose glands, lined by cells of the high cylindric goblet cell type. We have not learned, as yet, whether there may not be other important functions in these glands except the simple supply of a mucus secretion. As the internal os is approached, this mucous membrane becomes modified and we find the glands becoming less arborescent and the high cylindric epithelium lower in type. At the internal os, the simple tubular glands with a low cuboidal epithelium are found. The surface of the epithelium of the canal differs little with the exception that it is ciliated. The glands from the cervix produce a mucus secretion but in the endometrium there is only a thin secretion which is not true mucus. There is a difference both in their histologic structure and physiologic function. The manner in which infection may differ in its effect upon these two kinds of cells, so immediately adjacent, at once incorporated the aid of the bacteriologist. One is reminded of the problem of Europe, small countries of different kinds, so closely situated.

As long as the mucous membrane of the cervical canal remains unbroken, either by instrumentation or parturition, it seems to act as an efficient barrier to all organisms except the gonococcus, tubercle bacillus, and the spermatozoon. The chemist is not free from responsibility for here we have an acid secretion in the vagina and immediately adjacent within the canal an alkaline one. The constant bathing of cells which were intended to remain in an alkaline solution with acid as occurs in so-called erosion of the cervix may be of greater significance than we now know. With even the minor injuries which always necessarily accompany parturition, it is not difficult to understand the displacement of the various epithelial elements or so-called metaplasia. It may be of the utmost importance as to how these misplaced cells behave in their altered environment.

With reference to leucorrhea, it is conceded by all that one of its most important sources lies in the infection harbored within the mucous membrane of the cervical canal. Careful study of the anatomy of the cervix and a keen realization as to what happens to it, both in labor and in gonorrhea, makes it easy to understand its pathology. We are all familiar with the appearance of the cervix immediately after delivery. Bruised throughout and lacerated in hundreds of places, with exposure of blood vessels and lymphatics, the wonder of it all is that results are not worse. It is now generally believed that many cases of puerperal infection are caused by bacteria which have been harbored and protected previous to delivery in the tiny spaces provided by the complicated glandular arrangement in the cervical

mucous membrane, which has been crippled and deprived of its usual resistance by previous infection. While subinvolution, which is often followed by chronic deep-seated changes in the musculature of the uterus, may be due to infection from within the uterine cavity, much of it comes from infection which is harbored in the cervix and which might be prevented if proper attention were given to the healing of these injuries after delivery. Students and practitioners of obstetrics should be taught that their responsibility does not cease on the tenth day after delivery. Every case should be followed until the cervix is thoroughly healed and involution complete. No woman should be discharged until the cervix presents a normal appearance and it might well be added until the normal relationship of the muscles and fascia of the perineum have been restored. The same holds true in the treatment of a cervix after the acute stage of gonorrhea. Dickinson has called our attention to the carelessness of the gynecologist in his responsibility to infection within the cervix. Both the obstetrician and gynecologist have been so busily engaged in originating and perfecting major operative procedures that they have not given proper attention to the lesser and more important phases, which, if properly carried out, might do away with the necessity for many operations.

The specialist in genitourinary disease refuses to acknowledge the title venereologist. The gynecologist, with equal fervor, is entirely too much engrossed with the bigger problems to give sufficient time and attention to the proper care of the subacute neisserian infection. We need men in general practice, well trained in obstetrics and gynecology, who will do routine work in these fields.

In addition to the necessity for a keen realization of the changes which are secondary to a low grade infection within the cervix, it is important that in our teaching we make it clear as to what the pathologic changes of a chronic cervicitis, with so-called erosion, really are. Williams, at the last meeting of the American Gynecological Association, stated that in a series of cases where there was elevation of temperature postpartum, 40 per cent had not been examined. The impression must be that the infection is carried at some point and the best probable location must be the cervix. He also stated that there were twice as many infections among the black women as in the white and concluded that this may account for the relatively high mortality in this country as compared to others not inhabited by the colored race.

The proper conception of so simple a process as erosion of the cervix makes it much easier for the student to understand how it can give rise to so many serious complications. The bright red velvety patch surrounding the os, as seen through the speculum, has been termed an erosion. This is a misnomer. It is not an ulcerative and neither is it a granulative surface. The vaginal portion of the cervix in this instance becomes covered by a single layer of columnar epithelium which

has grown downward from within the cervical canal. Its red appearance is due to the thin covering of these columnar cells. In the healing process the layer of columnar cells, with its intricate glandular system, often becomes covered over by the extension upward of the squamous cells which cover over the vaginal portion of the cervix. In this way small cysts form. This pathologic process, or so-called erosion, begins either after childbirth, where there are numerous tears, or after infection. Care should be taken that the student thoroughly understands the pathology of this condition, for, while it seems trivial, it is most important. A clear understanding leads to a much better appreciation of the relationship to extension of infection and also cancer of the cervix. Unless special care is taken to make students learn this change in detail they will pass over it and fail to get this most important link. They will acquire a good knowledge of cancer of the cervix but this seemingly unimportant change, which may bear a very important relation from an etiologic standpoint, will be entirely overlooked. It should be remembered that after a certain time has elapsed superficial and comparatively simple changes may lead to an extension of infection throughout the cervix and the uterus as well.

When we stop to consider that little more than sixty years have passed since the origin of cancerous growths has really been understood, we should not become discouraged with the progress already made. During this comparatively short time, the literature on carcinoma of the uterus has increased tremendously, and there is little doubt that while we may not within the near future discover the exciting cause, yet we are rapidly acquiring certain knowledge which if applied in a practical way will go far toward reducing the rapid and widespreading tendency to the increase of this disease.

At the present, there is only one known way to combat cancer mortality and that is by the recognition of the process in its earliest stages or better to identify those lesions which are definitely known to be the forerunner of malignancy. Proper understanding and the recognition and correction of some of these early changes may greatly reduce the mortality of cervical cancer. When the fact that one woman out of every twenty-seven will die of cancer of the uterus secures a serious hold upon our minds then any method or theory which may diminish this possibility will receive attention. There are certain outstanding factors which are quite apparent in a discussion of the predisposing causes in cancer of the cervix. It is well known that women who have never borne children, or where there has never been any previous inflammatory process within the cervix, rarely develop malignant change of that organ. While it remains within the province of the bacteriologist or chemist to finally solve the actual process in cancer, there are certain outstanding basic principles in its growth and development which are appreciated by the clinician and

he should assist in the cultivation of this field which at present may be designated as "No Man's Land." There is undoubtedly a stage in the development of this disease which lies between its earliest inception and the condition in which it may finally be demonstrated as a true malignant change. There must be a period of time unknown at present where there is an ending of certain disturbed cell changes, which are not known as malignant ones, and the beginning of definite malignant change. Clinical experience has clearly demonstrated that there is a time when a growth from its macroscopic appearance suggests malignancy and yet when examined under the microscope shows changes which are not definitely malignant. This is now referred to as the precancerous stage. Ewing says, "It is not true that a pathologic condition must be either cancer or not cancer. It may be neither the one nor the other. Before an appreciable amount of invasive features can be found all kinds of variations may be present in the type of cell and amount of proliferation." It requires little imagination under these circumstances to picture a malignant growth in the developing stage. It is interesting to note that such changes nearly always occur in the presence of chronic inflammation. While the gulf between the cells of normal tissue and the cells of malignant tumors remains hidden and unexplained, the absence of any explanation should not blind us to the existence of certain clinical facts that are of great importance in a very practical way.

Virchow was an earnest believer in the theory that irritation was an important factor in the etiology of cancer. It remained for Fibiger to produce carcinoma in the stomach and esophagus of rats by infecting them with spiroptera, the cause of the malignant change being irritation of the mucous membrane by the parasite. Repeated applications of coal tar to the ear of rabbits has led to the conclusion that continuation of chronic irritation may cause a precancerous condition in epithelium previously normal. It is evident that the study must begin in the individual cell and it seems probable that the predisposing cause is a chemical one because tissue does not react the same to all forms of irritants. The constant bathing of an erosion of the cervix with its accompanying inflammation in a purulent acid secretion must be an important factor in the cause of malignancy. The period of time over which this may occur before cancer ensues is especially important and should be given due consideration. While we do not yet know the exact cause for this peculiar change, we know that for some reason the growth we call cancer is a proliferation of cells previously normal which increase in number until a mass is formed which attracts attention as a result of the changed condition of the normal structures. This does not happen in a day or a month and clinical experience teaches that it is a slow growth with its origin, perhaps, in a single cell which has renounced its allegiance to the normal body control.

How long the cause may have existed before the onset of malignancy is unknown. It is probably true that we can seldom anticipate when cells may rebel and a mutiny ensue, but if on the alert we can keep all points subject to local irritation and infection free from chronic inflammatory change and by this means prevent the end-result, which, in some instances, is undoubtedly cancer. It is important to bear in mind that the chemical reaction within the uterus is alkaline, in the vagina, acid. The vaginal canal must necessarily contain a great number of various kinds of microorganisms. The inside of the uterus, under normal conditions, is sterile. When the cervix sustains tears which evert the cervical mucous membrane into the vaginal canal, it is quite probable that conditions are favorable to the development of malignancy. The cells of the cervix which ordinarily live in a field which is alkaline and sterile are thrown into a field where the reaction is acid and where there is infection. We do not yet know the reaction of cells under these changed conditions. Infection, under these circumstances, ascends into the cervix and body of the uterus producing a mucopurulent discharge which pours over the injured cervix, thereby causing further irritation. The epithelium from the vaginal and uterine sites both grow in and fill the defect with the result that the squamous cells become displaced deep into the cervix sometimes filling the glands and sometimes covering the gland cells.

It not infrequently happens that pathologists report suspicious changes in specimens of amputated cervixes which suggest the possibility of malignancy. Displaced epithelium as a result of previous injuries and chronic inflammatory changes is quite common here and some of these so-called precancerous changes differ so little from what later is undoubted cancer that their importance cannot be overlooked. We look upon some of these cases, where the signs have been so characteristic, as potentially malignant and the operation of amputation of the cervix as having been a truly preventive one so far as cancer is concerned.

In 1906, I presented a paper under the title of "Pre-cancerous Lesions of the Cervix," in which four cases of cancer of the cervix were reported which had been under my care and observation for a considerable period previous to any evident development of malignant change. These patients all had been treated for cervicitis and carefully observed for two or three years previous to the development of any of the active symptoms of cancer. The development of malignancy which seemed to have been literally grafted upon these diseased cervixes made a deep and lasting impression and has led to a firm conviction that there must be some association between these conditions. Since that time, we have continued to stress the importance of this relationship in our teaching. The observation from time to time of certain close relationships, between what may be benign and malig-

nant changes, led to the more firm opinion that nothing is yet known about the life of cancer. In other words, it is yet to be discovered how long a given cell may be in a state of irritation and undergoing certain mild changes before it finally assumes its true malignant form. It is here that close cooperation must be carried out by the clinician and the pathologist, neither of whom should be guided by preconceived ideas or prejudices in the study of cervixes undergoing these chronic inflammatory processes. It is important that the pathologist has a keener interest in the history of these patients and that he sees the cervix in situ, so that he can acquire a better appreciation of the appearance of the cervix and its environment. This, together with a careful section over many areas, after its removal, may finally lead to a better understanding of what the true precancerous stage may be, or at least definite knowledge of the intervening cell changes.

Hunner has given to us a method of treatment for erosions and other chronic infections within the cervix, which, as a preventive and curative measure, should place his name in the Hall of Fame. Cauterization of the cervix, if properly used, will save many lives and give comfort to a greater percentage of women than any other simple procedure in surgery. It should be emphasized, however, that it is an operation which must be used effectively or its results will be disappointing. This is true in the more chronic and deep-seated infections of the cervix where there is a great excess of connective tissue and glands buried far beneath the surface. In these cases the entire infected tissue must either be removed or destroyed. Formerly a high amputation was done, but in our hands we failed to cure a certain percentage of cases where the leucorrheal discharge was the important factor because it was sometimes difficult to excise completely the infected mucous membrane lining the cervical canal. We now use the cautery or excise the entire diseased area with the endotherm knife. The latter is ideal sometimes when there is extensive and deep-seated infection with hypertrophy. This method requires some form of anesthesia as it is impossible to accomplish this result in the office with a light cautery. We have treated 2985 chronic cases by this method during the last ten years and seldom fail to cure the leucorrhea. During this time we have never found a case of carcinoma develop in the cervix of patients so treated. This number is too small, of course, for one to draw any conclusions as to the prophylactic results in so far as malignant change is concerned. Is it not worth while, however, for us to consider this phase of the subject? With the rapidly increasing numbers of women who are thus treated it is quite possible that in another twenty years some conclusion can be made. It is entirely speculative as to how much we may really learn about the treatment of cancer during that period. It would seem much more important for us to study the results in a large series

of cases so treated in reference to the development of cancer than to waste further time in arguments as to the best method of treatment after it has become a certainty. The more acute cases of erosion of the cervix, or cervicitis, such as follow neisserian infection or delivery, may be treated in the office with a small cautery with good results. In fact, it is the ideal method in the subacute stage of these lesions and may be employed without any special skill. Its employment saves time and is much better than the use of local applications, such as carbolic acid, nitrate of silver, etc., in the recent and milder forms, but in chronic cervicitis it will often fail to cure. We have observed cases of the chronic type so treated which were not cured of the discharge because the treatment had not removed all areas of infection. In our experience, 85 per cent of women bearing children have cervicitis of varying degree and it is seldom, even months after delivery, that we find a healthy cervix free from all evidence of inflammation. The establishment of the normal cervix after delivery is a responsibility of every one practicing obstetrics today. If this is done both puerperal sepsis and cancer may be prevented and in addition the woman may have comfort. Leucorrhea is such a common symptom among women that it is not taken as seriously by the physician as it should be and the poor woman, with the patience of her sex, toils on without complaint.

The League of Nations has proposed international war against rats for their complete extermination. It has been said that such a war, made to include flies and mosquitoes, would be the best war in history. No rats, no bubonic plague; no mosquitoes, no yellow fever or malaria; no tsetse flies, no sleeping sickness.

The world is apparently awakening to the remedy for these various ills, and, while it may be many years before we know the exact relationship between the various hosts and poisons which they communicate to man, no time will be lost in the attempt to rid ourselves of these enemies which serve as hosts to agents which lead to our destruction.

This analogy may be applied to the diseased cervix. It is our duty to awaken from a state of lethargy and teach both the profession and the public that every diseased cervix should be cured as it carries with it the possibility of malignancy. When this is actively done, cancer of the cervix, like tuberculosis, may begin to lessen in frequency. If we sit quietly by, waiting for the discovery of the actual cause and its attending phenomena, hoodwinked to the already existing facts, thousands of lives will continue to be lost, for, many years may elapse before the problem of cancer is clearly understood. In the meantime, we should not be blind to certain self-evident facts which are important elements in the prevention of cancer, even after its active cause may have been discovered.

✓ A STUDY OF 165 CONSECUTIVE CESAREAN SECTIONS INCLUDING A COMPARISON BETWEEN 104 CLASSICAL OPERATIONS AND 61 LAPAROTRACHELOTOMIES*

BY JAMES KNIGHT QUIGLEY, M.D., F.A.C.S., ROCHESTER, NEW YORK

THIS comparatively small series represents the experience of one obstetrician over a period of time sufficiently long to reflect improvements in technic and modified indications, and for these reasons it seems that a review might not only be of interest but also of value.

The cases here reported were not selected but are the sum total of my series actually operated by myself during the past fifteen years, including private and consultation patients and those treated in a public ward service.

Elective operations done before onset of labor	74
Test labor varying from 5 to 96 hours	81
Patients in labor but who did not have a test	10

There were 128 private patients of whom 21 were consultation cases seen only after they had gone into labor. Ward patients numbered 37, many of whom were sent into the hospital after a long labor outside having had vaginal examinations and in some of whom the membranes had ruptured.

Many would not be considered good operative risks; for instance, one patient had been bagged, two with placenta previa had been packed outside the hospital, 50 had had from one to five vaginal examinations made, and the membranes had ruptured in 29, the time elapsing from rupture to operation varying from one to sixty hours.

One hundred twenty-three patients were operated upon at one hospital (The Rochester General) and 41 in the other four hospitals of the city. Fifteen women were operated upon twice and on five of them three sections were done from which it will be deduced that there were 135 different patients.

The distribution as to the parity of the patients is:

Para i	84	Para iv	7	Para vii	2
" ii	46	" v	1	" ix	1
" iii	20	" vi	4		

Indications.—The question of the justification for the performance of delivery by abdominal section is more unsettled perhaps than any angle from which the subject is discussed. The operation is over-

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists and Abdominal Surgeons, Toronto, Ont., September 10-12, 1928.

popularized by the laity in many communities and one is as apt to be criticized by the unthinking for not having performed a cesarean section as one is for having done one. The indications in this series were many, perhaps too many, yet when one considers that of the 165 sections, 81 had had a test of labor and that of the balance, 27 were done on cases operated before, it would seem that at least one could not say that these operations were hastily done without a thorough evaluation of the conditions that were met. Another point to be considered is that in many cases more than one factor entered into the decision to operate. For instance, in seventeen cases of borderline pelvic contraction, the patient had lost one or two children from difficult deliveries previously, and I think few obstetricians, after a test of labor would be willing to attempt a high forceps extraction or delivery by version in a case with such a history.

Elderly primiparity was given as a sole indication in three cases, nevertheless all three had been subjected to trial labor, the competing procedures were high forceps, version and cesarean section. In nine other patients elderly primiparity was a secondary consideration in making a decision.

Disproportion is given as a reason for six operations, all these patients had good trial labors of from ten to twenty-one hours and the babies weighed from eight to eleven pounds.

Fibroids complicating labor in seven cases caused me to decide for abdominal delivery. In three the growth was frankly obstructive,

TABLE I. INDICATIONS

	CLASSICAL	LOW-CERVICAL	TOTAL
Flat pelvis	34	29	63
Justo minor pelvis	27	9	36
Funnel pelvis	4	1	5
Chondrodystrophie dwarf	2	0	2
Kyphoscoliosis	0	1	1
False promontory	1	0	1
Ankylosed hip	2	0	2
Disproportion	1	5	6
Mentoposterior, after test of labor	0	1	1
Previous cesarean section	8	1	9
Fibromyomas of uterus	2	5	7
Cervical cicatrix after amputation, test of labor	1	1	2
Rigidity of cervix	0	3	3
Postmaturity, elderly primip., test of labor	1	0	1
Placenta previa	5	0	5
Abruptio placentae	5	0	5
Elderly primiparity, primary sole indication	2	1	3
Eclampsia	1	0	1
Toxemia		1	
1. Primipara of 43			
2. Cardionephritic primipara of 38	1		
3. Plus pulmonary tuberculosis	1		3
Cardiac disease			
1. Four months, sterilized			
2. Plus large cystic goiter	2	0	2
Bicornate uterus	1	0	1
Contraction ring dystocia threatening rupture	2	3	5
Fetal asphyxia elderly primip., postmature, test	1	0	1
	<hr/> 104	<hr/> 61	<hr/> 165

another was in an elderly primipara becoming exhausted from a long labor, in three I believe that small multiple fibroids in the lower uterine segment so affected the musculature that dilatation, contraction, and retraction were impossible. In two of these the uterus went into tetanic contraction after a test of labor with the cervix insufficiently dilated to permit delivery below.

Previous cesarean section. In these patients there was reason to question the integrity of the uterine scar.

Technic.—Classical section was performed 104 times and laparotrachelotomy or low cervical section was performed 61 times. The first fifty-seven were of the classical type while of the last 108 sixty-one were laparotrachelotomies and forty-seven classical.

By classical cesarean section is meant an incision through the upper portion of the body of the uterus through an abdominal incision above the umbilicus, the uterus is closed in three layers, one of which is of interrupted chromic sutures. By laparotrachelotomy or low cervical section is meant the Beck two-flap modification of the original Sellheim operation later described by Kroenig.

The first laparotrachelotomy was done by me over seven years ago on a patient with a flat pelvis, seen in consultation after fifty-two hours of labor conducted with five vaginal examinations. She was becoming exhausted and delivery was imperative, she was obviously not a candidate for the usual or classical cesarean section. Although the puerperium was febrile the successful outcome of this case made such an impression on me that I have employed this technic since in any case subjected to trial labor, and more recently it has been given wider application and unless otherwise contraindicated is the method of choice for all abdominal hysterotomies. The reasons for this decision have been:

1. Sutures placed in the lower uterine segment are not subjected to as much stress from contraction and relaxation of the uterine musculature making for a stronger scar. Four patients in this series have been operated upon twice and one thrice by the low cervical technic, in all of these the scar in the uterus could not be identified.

2. A lessened liability to uterine rupture in subsequent pregnancies and labors. There have been only ten ruptures in the 3600 reported operations, 0.28 per cent as against 2.5 to 4 per cent for the classical operation.

3. Because of this the dictum "Once a cesarean always a cesarean" is not as valid today as it was a few years ago. It is safer in other words, to permit of a trial labor in cases where the indication for the original low cervical section was extrapelvic than were the original operation the classical.

4. The cervix is more tolerant of infection.

5. The lower abdomen stands infection better than the upper.

6. In case infection does occur outside the uterus it is in a location most favorable for its localization and evacuation.

7. There is much less chance for peritonitis postoperative, the most frequent cause of death following classical cesarean section.

8. With this type of operation in reserve a real test of labor may be employed in borderline pelvic contraction and it will be found that a large percentage can be delivered per vaginam.

9. It can be used in referred cases seen late in labor, unless they have been grossly mismanaged.

10. The mortality is lower, a series of 620 operations with only 6 deaths (3 of which were nonoperative deaths) in one clinic, a percentage of less than 1 as against 4 to 5 per cent in unselected series of classical sections.

11. The comfort of the patient in comparative freedom from vomiting, distension and pain, these patients present as little evidence of shock or exhaustion as one following a clean appendectomy and much less than the case subjected to a difficult instrumental delivery through the pelvis.

Details of technic in the 61 cases of laparotrachelotomy which might be briefly mentioned are:

The anesthetic preferably local plus nitrous-oxid-oxygen. No morphine given until after the delivery of the baby. The head was shelled out manually, forceps were applied only three times.

The placenta was in all cases delivered through the abdominal incision, I have never been convinced of any advantage in pushing the placenta through the cervix or in leaving it to be expelled by uterine contraction. No traction on the cord was employed in delivering the placenta, recently two cases have been reported of inversion of the uterus through the wound, ascribed to removal of the placenta by pulling upon the cord.

Suturing of the uterus is begun at the lower angle as the bleeding is more brisk than above, two rows of chromic suture, one of which is always interrupted are used in closing the uterine muscle.

The transverse uterine incision has not been employed because of greater hemorrhage at the angles of the incision, a location much more vascular than that of the vertical incision. Three conditions in which I believe the classical section is preferable to laparotrachelotomy are: (1) abruptio placentae, (2) placenta previa, (3) in very obese subjects.

Morbidity.—Although the mortality in this series is very low the amount of postoperative disturbance was sufficiently high to give me a real appreciation of the seriousness of the operation. This was due almost entirely to the type of cases encountered. Ten of the patients pursued a rather stormy convalescence; uterine infection, fat embolus and a temporary hemiplegia, postoperative tetanus and an acute cholecystitis were some of the specters which did not add to the

TABLE II

			FEVER*	
<i>Classical</i>			10	
Test of labor		35		
Shortest	5 hours			
Longest	48 "			
Average	17.3 "			
Elective		63	17	
In labor		6	2	
		104	29	
<i>Low Cervical</i>				
Test of labor		46	19	
Shortest	5 hours			
Longest	96 "			
Average	21.1 "			
Elective		11	4	
In labor average 7 hours		4	0	
		61	23	
<i>Entire Series</i>				
Test of labor		81	29	
Elective		74	21	
In labor		10	2	
		165	52	

safety of the patients or to the peace of mind of the operator, with one exception, the first laparotrachelotomy, these were cases operated upon by the older technic.

Fifty-two were febrile, using an index of 100.4° on two consecutive days. Although abdominal wound infection was encountered there were no ventral hernias resulting. Pelvic infection was limited to the uterus. Acute gastric dilatation complicated five cases but responded to lavage and absolute rest to the stomach.

In one case known to me (No. 40 and repeat No. 54) at a subsequent labor when an attempt was made in another hospital to effect delivery through the pelvis a uterine rupture resulted. Four cases are known to have been delivered below in subsequent labors.

Mortality.—

TABLE III

	MATERNAL	FETAL
104 Classical sections	2 or 1.92%	7 or 6.5%
61 Laparotrachelotomies	0	0
165 Total operations	2 or 1.22%	7 or 4.2%

Of the last 129 sections the maternal mortality is nil.

Fetal mortality theoretically should be nil in cesarean section but in this series seven (or 4.3 per cent) babies were stillborn or died soon after birth. The first, the child of an eclamptic mother died probably during the operation as the fetal heart was strong before she went to the operating room. The remaining were all premature and five of the six were cases of abruptio placentae, the one condition

*100.4° F. on two successive days.

where it is justifiable to do a cesarean section when there is a question as to the survival of the infant, three of these mothers were toxic.

Maternal mortality was two or 1.22 per cent, these were cases Nos. 19 and 36. Number 19, eclampsia in mother, an elderly primipara who had been out to a dinner party at seven had two convulsions before my arrival as consultant at eleven. She was hospitalized and given morphine to the degree of lowering respiration markedly, her convulsions continued and at the urgent insistence of her family a section was done in the early morning hours. She continued to have convulsions and died a few hours postoperative, convulsive toxemia was the cause of death in this case. This was over eleven years ago and I wish to state it as my belief that abdominal delivery is not the treatment for eclampsia. Two surveys of cesarean sections done in two cities, viz.: New Orleans and Detroit showed a maternal mortality for cesarean section on eclamptics of 42 and 40 per cent respectively. Number 36 a primipara of thirty-six with a justo-minor pelvis was operated upon after fourteen hours of hard labor, she had a postpartum hemorrhage immediately postoperative, and in spite of various agents given to contract the uterus it never responded and before the patient could be transfused she had died.

In closing I wish to quote a paragraph from a paper I wrote four years ago reporting the first fifteen low cervical sections. "It is not claimed that by the employment of this technic all infection is obviated, it will not prevent intrauterine infection, bacteremia, extension through lymphatic channels or embolic processes, but it does in the vast majority of cases prevent the development of general peritonitis, which is by far the most frequent cause of death following cesarean section done by the old or classical method."

26 SOUTH GOODMAN STREET.

(Discussion to be published in a later issue)

The American Journal of Obstetrics and Gynecology

VOL. XVII

ST. LOUIS, MAY, 1929

No. 5

Original Communications

DECIDUAL FORMATION ON THE PERITONEAL SURFACE OF THE GRAVID UTERUS

By J. HOFBAUER, M.D., F.A.C.S., BROOKLYN, N. Y.

(From the Department of Obstetrics, Johns Hopkins University and Hospital)

THE recognition of the appearance of ectopic decidual cells on the peritoneal surface of the pregnant uterus dates back to Pels-Leusden who first described them in eclamptics in 1895. Schmorl, in 1898, emphasized the fact that in the pregnant organism decidua formation is not confined to the endometrium but may also occur at other sites. Of these, the ovaries and culdesac constitute the favorite localities. In recent years Geipel gave an account of the occurrence of decidua in the omentum, the pelvic lymphatic glands and on the appendix. Attention was directed by these writers to the observation that, although in many cases the presence of decidual cells beneath the peritoneal coat can only be recognized microscopically, the reaction may sometimes be so pronounced as to produce papillae, or flat, slightly protruding areas, or even small nodules. Such phenomena have been recorded repeatedly since, particularly as occurring low down on the posterior surface of the uterus in the neighborhood of Douglas' pouch and over the pelvic peritoneum. So, too, J. W. Williams described a case in which the pregnant uterus was the seat of a diffuse adenomyoma and the stroma of the adenomyomatous islands had become converted into typical decidua.

Our interest in the subject was aroused by a number of remarkable clinical observations incident to macroscopically visible decidua formation on the peritoneal surface of the pregnant uterus; and subsequently, by the microscopic findings which revealed several hitherto undescribed details relating to the mode of production of the condition.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

At this point attention may be called to Fig. 1, which shows the condition observed on the left half of the posterior uterine surface of an eclamptic patient at term. The striking feature of the case consists in the presence of an extensive raw area extending from the insertion of the ovarian ligament down to the cervical region below the insertion of the sacro-uterine ligament. The area is triangular in shape, with its base toward the culdesac, and involves both the posterior fold of the broad ligament and the lateral margin of the uterus. It appears as a

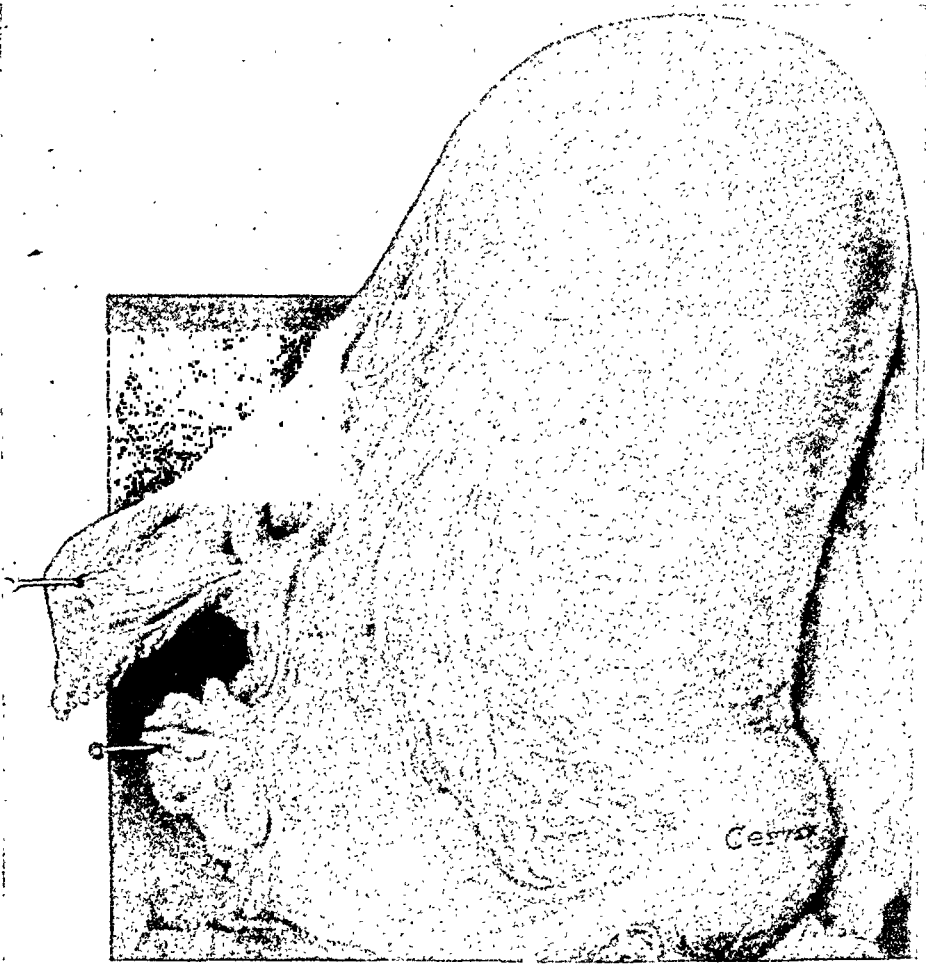


Fig. 1.—Posterior surface of puerperal uterus, showing roughened area of ectopic decidua at the posterior fold of the broad ligament.

roughened ulcer-like layer with thickened, ragged edges, while higher up it is flatter and looks as if its surface had sloughed away. Similar, though somewhat less developed, findings were also present on the right side and corresponded in every feature to the area just described. Fig. 2 gives a diagrammatic representation of the condition.

A similar distribution of symmetrically arranged, denuded areas on the posterior surface of the pregnant uterus was found a few weeks later at autopsy of a young primipara who had developed fulminant toxic symptoms at term. For microscopic study blocks were excised

from the areas involved and serial sections made. In addition, bits obtained from various parts of the omentum, appendix, and sacro-uterine ligaments were imbedded, cut, and studied although these structures had appeared perfectly normal on gross examination.

Having become familiar with the gross appearance of ectopic decidua on the uterine peritoneum, we focused attention during the last year on the detection of velvet-like areas, suggestive of ectopic decidua, on the posterior surface of all pregnant uteri exposed at operation. These areas are readily recognizable with the naked eye on account of their

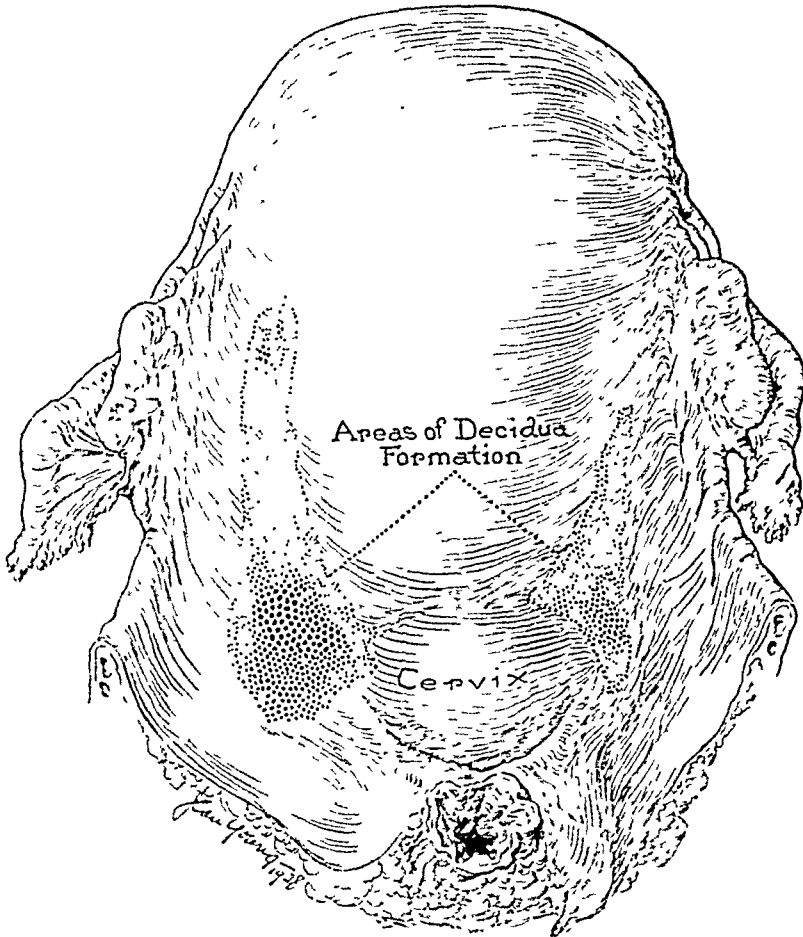


Fig. 2.—Diagram showing decidua formation on the posterior surface of the pregnant uterus.

dull sheen and roughened surfaces. Besides, whenever a pregnant uterus was removed, the lowest portion of its posterior surface was examined microscopically as a routine.

Fig. 3 shows the decidual reaction in the omentum, as seen in the two cases of extensive uterine decidual formation just described. The decidua cells are seen lying beneath the peritoneal covering, clustered together to form groups and associated with small lymphocytes (Fig. 3). The decidual cells are large, of ovoid, oblong or bizarre shape, and contain from one to nine nuclei. The groups of decidual cells do not project

beyond the surface of the omentum and are best seen in its inferior portion near the pelvis, although single cells or even small groups are occasionally found in its upper part. A rich content of glycogen and a tendency toward vacuolization characterize the decidua cell in the omentum. A few elements of decidua were also found in the mesenterium of the appendix while beneath the germinal epithelium of the ovaries larger groups of such cells appeared in places, evidently representing stigmas produced by previously ruptured follicles. Geipel claims to have demonstrated the presence of decidua in the omentum in 90 per cent of his cases, and found its formation especially developed

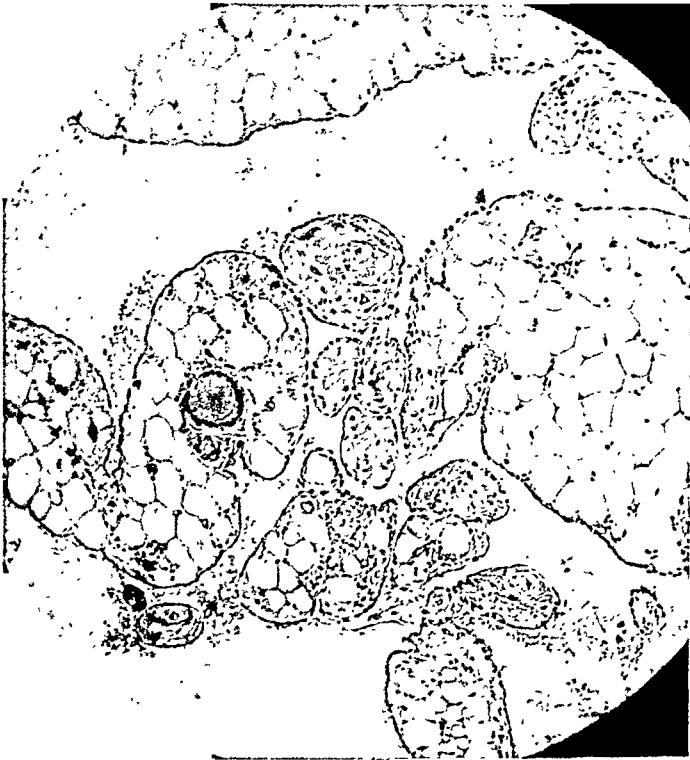


Fig. 3.—Decidua formation in the omentum.

at the tips of the omentum, sometimes as early as in the third month of pregnancy. In our study the figures are not yet sufficient to permit a definite statement as to the frequency of involvement of the omentum.

Up to the present the development of ectopic decidua on the posterior aspect of the pregnant uterus was found in fifteen of the twenty-three specimens examined. Among these fifteen cases, six showed a wide distribution of decidual reaction: two of them have already been referred to; two others occurred in association with premature separation of the normally implanted placenta with serious clinical symptoms; while the fifth and the sixth patients suffered from nephritic toxemia.

Such extensive involvement of the peritoneum on the posterior surface of the pregnant uterus as was seen in our first cases has not yet been recorded in the literature. Furthermore, upon careful microscopic study of the sections, certain new features concerning the structure in point were established. At the outset it was obvious that the decidual cells in question showed great variation both in size and form. Whereas the ectopic decidua is ordinarily arranged in several layers and in structure closely resembles that of the intrauterine decidua (see Fig. 4), it is the great diversity in shape which constitutes the peculiarity of the decidual formation in the instances under consideration: polygonal, spindle-shaped, ovoid, and exceedingly elongated ameba-like cells with numerous protrusions are frequently seen in the same field.

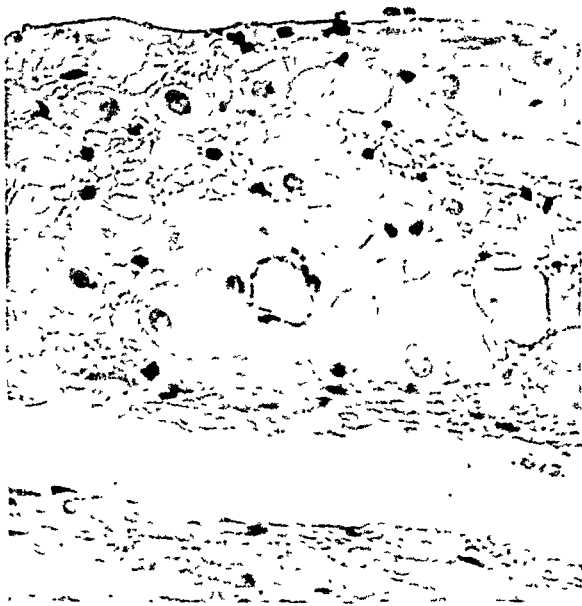
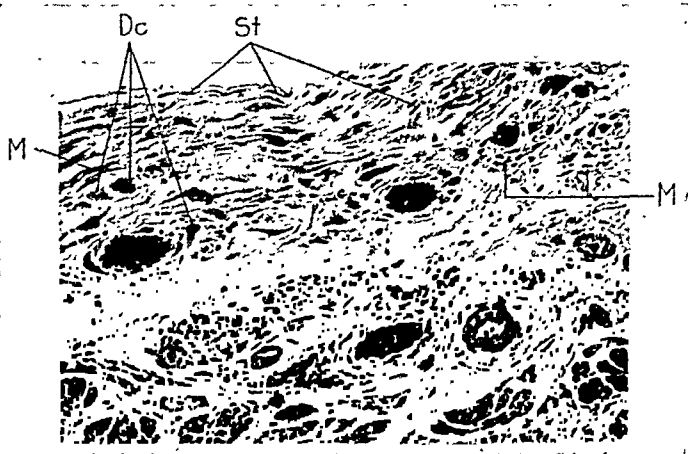


Fig. 1.—Decidua on the posterior surface of pregnant uterus.

Some of the cells have a single nucleus, while others show as many as three to eight, thus resembling giant cells. Vacuoles in the cytoplasm are rather common. Quite frequently the decidual cells extend around small vessels in the shape of a sheath. The covering mesothelium of the peritoneum is well preserved and never shows any participation in the decidual reaction. On the other hand, there is a definite type of small spindle-shaped cells with dark ovoid nuclei and scanty cytoplasm which are present in the connective tissue layer beneath the peritoneal mesothelium, and from which the decidual cells appear to be derived, inasmuch as all stages of transformation from this stem-cell to the various forms of decidua cells are readily demonstrable. The first phenomenon occurring in this transition consists of an increase in the amount of cytoplasm which henceforth retains its characteristic ability to stain

bluish-gray with hematoxylin. Next, the nucleus enlarges and not infrequently undergoes amitotic division, whereupon the further development to the manifold instances of decidua elements progresses.

It is a matter of no little interest that in the same locality phenomena occur which indicate possible transition stages from the stem-cells just described to unstriated muscle fibers. This is rendered probable by the fact that, scattered between the decidua cells or arranged in groups, there can be seen numerous elements which still retain the characteristics of the native mesenchyme cell but, at the same time, show a tendency toward development into muscle tissue by the growth of their cytoplasm which elongates transversely and stains pinkish with eosin. The formation of smooth muscle is first indicated by a marked elongation of some of the nuclei of the mesenchyme cells, which is surrounded



Figs. 5-8.—Microphotographs showing phenomena of development of decidua cells and plain muscle from mesenchymal stem-cells. Dc, decidua cells; M, muscle; St., stem-cell.

by an increase in the amount of granular protoplasm surrounding the nuclei and by the development of rather coarse protoplasmic processes. In the protoplasm of the elongating cells myofibrillae are formed which appear as more or less distinct longitudinal striations and stain intensely with protoplasmic stains. With further development and proliferation regular strands of delicate plain muscle appear in the subperitoneal layer where ordinarily such tissue is lacking. The process of histogenesis of plain muscle structure in situ from stem-cells is visible throughout the entire series of sections.

The conclusion which suggests itself from a consideration of these observations is that we are here dealing with the differentiation into two different structures, viz., decidua and plain muscle, from a single undifferentiated type which has retained its original mesenchymal potencies; and in response to varying stimuli has developed in different

directions. Consideration of photomicrographs in Figs. 5, 6, 7, and 8 serves to exemplify the phenomena observed.

In association with the development of ectopic decidua upon the exterior surface of the uterus there was noted in several instances another phenomenon of considerable interest. The peritoneal endothelium in discrete places had assumed an epithelial appearance with invaginations resembling gland formation. Where these structures are seen dipping into the newly formed decidua the picture presented is almost indistinguishable from decidua vera. It was particularly noticeable in several clinically severe cases of premature separation of the normally implanted placenta that the peritoneal endothelium upon the surface of the uterus had in places become actually cylindrical; and its association with intense development of ectopic decidua both upon the

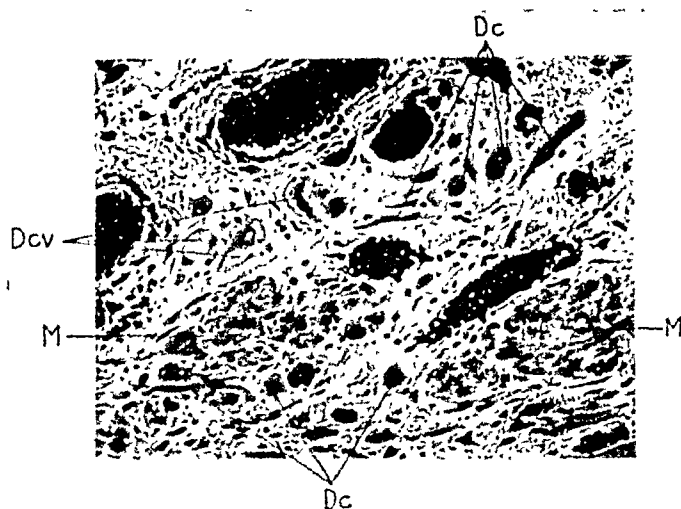


Fig. 6.—Dc, decidua cells; M, muscle; Dcv, vacuolated decidua cells.

posterior wall of the uterus and in peritoneal adhesions presented a striking picture. Furthermore, in several clinically normal cases there appeared within the outermost uterine layer gland-like spaces lined by high columnar epithelium which had lost all connection with the peritoneal covering.

The widespread metaplasia of the peritoneal mesothelium into cylindrical cells in cases of premature separation of the normally implanted placenta is of particular interest since clinical experience has taught us that the presence of abundant blood-stained free fluid in the abdominal cavity constitutes a remarkable feature of that condition. As a corollary, Cunningham has succeeded in showing that, following the repeated injection of foreign substances (glucose, blood) into the peritoneal cavity of animals, metaplastic changes may occur in the mesothelium which result in the formation of one or even two layers of cuboidal

or cylindrical epithelium. The development of similar types of cells in tissue cultures obtained from serosal mesothelium furnishes further proof of the validity of the present view on the embryonic potentialities inherent in mesothelial elements. This statement accords with the belief advanced by Gatenby that in lower animals discrete areas of peritoneal mesothelium may become converted into gonads by processes of transformation and differentiation.

Evidence confirmatory of metaplastic changes occurring in mesothelial cells is likewise to be found in the well-known fact that gland-like structures may develop in the superficial layers of the ovaries of pregnant and nonpregnant women. If we remember that embryologic study gives considerable support to the view that the three structures,

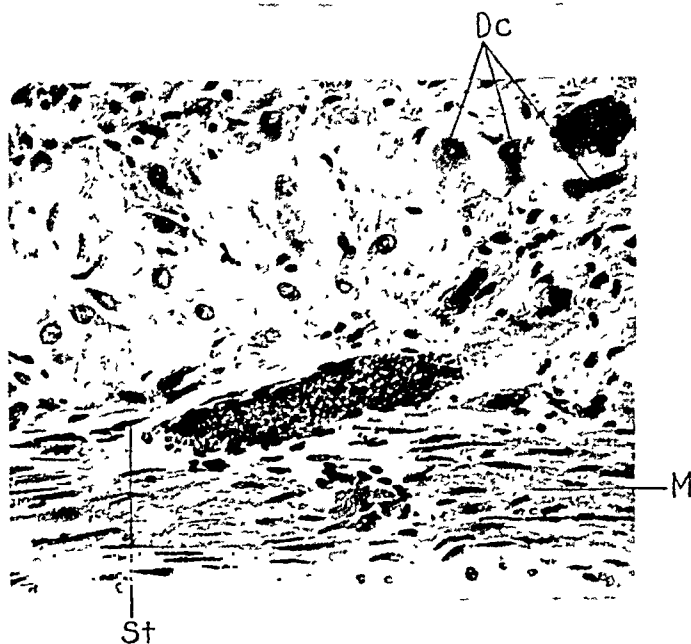


Fig. 7.—Dc, decidua cells; M, muscle; St, stem-cell.

pelvic peritoneum, germinal epithelium, and uterine epithelium, can be regarded as derivatives of the celomic epithelium, it becomes apparent that under the influence of certain stimuli identical differentiation may occur in one or all of these elements.

The developmental potentialities of the subcelomic mesenchyme cells may therefore manifest themselves in two ways, as herein recorded, viz., in the formation of decidua cells and of unstriated muscle. It remains to be emphasized that the presence in the adult of undifferentiated mesenchyme cells in the omentum has been established by the studies of Maximov, Seifert, and others. Hence, the decidua reaction of the omentum during pregnancy may be regarded as a response of those elements to the same activating stimulus as is concerned in the production of both ectopic and intrauterine decidua.

Our present knowledge of the nature of the activating principle in the initiation of decidua formation is admittedly imperfect. The experimental work of L. Loeb suggested that the hormone of the corpus luteum might be the responsible factor. F. B. Mallory claims that absorption of a chemical substance (a hormone) secreted by the chorionic epithelium may stimulate fibroblasts to proliferate and become transformed into decidual cells. If this be the case, it is conceivable that diffusion of this hormone from the uterus by way of the oviduct may cause decidual formation on the outside of the uterus. Recent evidence, however, would seem to point to the anterior lobe of the hypophysis as the stimulating element. In this connection there are three things to be remembered: In the first place, the experimental work of Zondek and Aschheim with repeated transplantation of anterior hypophyseal substance into virgin rodents shows that the formation of decidua

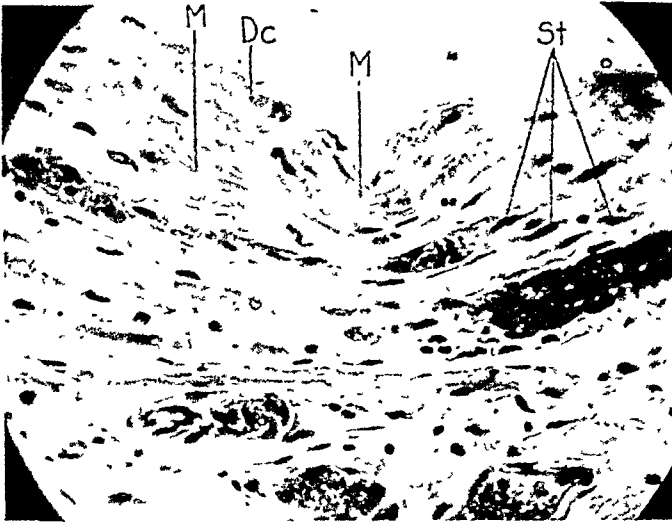


Fig. 8.—Dc, decidual cells; M, muscle; St, stem-cell.

in the uterine mucosa is a constant feature. Second, in nonpregnant women suffering from acromegaly, due to overgrowth of the anterior lobe of the hypophysis, the occurrence of typical decidual nodules in the culdesac has recently been described by Wagner. Finally, the observation made in the present study that, in certain types of toxemia of pregnancy, ectopic decidua represents rather a common occurrence may possibly be taken as evidence in support of the modern conception that a hyperactivity of the pituitary gland may play a part in the production of eclamptic and preeclamptic conditions (Hofbauer, Küster, Eufinger). If we consider this view in conjunction with the recent conception advanced by Evans, Hofbauer, Zondek, Ph. Smith, that it is the anterior lobe of the hypophysis per se which controls ovarian

activity and stimulates both formation and function of the corpus luteum, it would seem that we have obtained a clue toward the solution of our problem.

In conclusion, it is interesting to recognize the marked resemblance which exists between the topographic distribution of ectopic decidua and endometriosis. From the observation made in the present investigation that the production of aberrant decidua is due to a development in situ from mesenchyme elements, which have retained their embryonic potentialities and which may result in the formation of glands, decidual cells and muscle, it follows that the etiology of endometriosis may be considered from a similar point of view. These remarks must not, however, be taken to imply that we do not accept the theory of implantation in many instances of endometriosis. As a matter of fact, we do. On the other hand, basing my argument on the local development on the posterior surface of the pregnant uterus of structures resembling uterine decidua, I am inclined to favor the theory that, given the proper stimulus, the local elements, both mesothelial and mesenchymal, may possibly take some part in the formation of ectopic endometrial tissue. This stimulus, according to Cunningham, may be the presence of blood. It is common knowledge that a reflux of menstrual blood through the tubes into the pelvic cavity occurs not infrequently. This blood may be the etiologic element involved in that stimulation of the mesothelium and mesenchyme which results in endometriosis in some instances. Experimental study to decide this question is now under way.

REFERENCES

- Pels-Leusden*: Virchow's Arch. 97: 1895. *Schmorl*: Monatschr. f. Geburtsh. u. Gynäk. 8: 1898; Ztschr. f. Geburtsh. u. Gynäk. 11: 1902. *Geipel*: Arch. f. Gynäk. 106: 176, 1916, 181: 1927. *Cunningham*: Am. J. Anat. 30: 1922; Bull. Johns Hopkins Hosp. 35: 1924. *Gatenby*: Quart. J. Micr. Sc., 1916, 1924. *Williams, J. W.*: Tr. South. Surg. A. 17: 1904. *Seifert*: In V. Mollendorf's Handbuch der microscop. Anatomie, Bd. I, 1927. *Zondek u. Aschheim*: Klin. Wehnschr. No. 18, 1928. *Wagner*: Centralbl. f. Gynäk. No. 1, 1928. *Hofbauer*: Ibid. No. 3, 1918, 1924. *Küstner*: Arch. f. Gynäk. 132: 133: 1927. *Eufinger*: Ibid. *Evans*: Anat. Record 21: 1921. *Mallory, F. B.*: Am. J. Path. 2: 467, 1926.

CHOLECYSTOGRAPHY AS AN AID IN DETERMINING GALL BLADDER STASIS IN PREGNANCY*

BY SAMUEL J. FOGELSON, M.D., CHICAGO, ILL.

(From the Surgical Department of the Northwestern University Medical School.)

THE greater incidence of cholelithiasis in women, is undoubtedly secondary to pregnancy. Courvoisier found cholelithiasis present in every fourth woman and in every twelfth man in 16,025 autopsies. Schroeder found gallstones in 20 per cent of all females and 4.4 per cent of all males autopsied. W. Mayo reports that 90 per cent of 3075 female gall-bladder patients had their first symptoms during pregnancy. Peterson in 1910 reviewed this subject and reported his observations based upon the examination of the gall bladders of women he operated upon for a gynecologic complaint. He found that pregnancy increased the incidence of gallstones about 10 per cent, and further determined that about one-third of the patients could report the onset of a biliary attack when the uterus reached the umbilicus, thus pressing upon the gall bladder and biliary ducts.¹¹

Of all the possible factors in pregnancy which can be blamed in the etiology of gallstones, stasis is generally accepted as most significant. Practically all authorities agree that such a stasis is present but differ in explaining its origin. Prior to the last few years the general consensus of opinion was that this stasis resulted from mechanical pressure of the gravid uterus upon the gall bladder or its ducts. Cannon in his text upon mechanical factors in digestion demonstrated that an increased intraabdominal pressure would affect the gall bladder and ducts equally, thus eliminating itself as a factor in causing stasis.

In 1922 Westphal¹⁰ fluoroscoped gravid women in the ninth month of pregnancy when the uterus was highest and noted that quite frequently there was no direct pressure of the uterus upon the lower liver surface. In his experimental work he demonstrated an increased tone of the sphincter of Oddi and believed that in this way bile was dammed back into the biliary system.

With the advent of cholecystography and with Boyden's observations upon the emptying of gall bladders by fat meals,¹ there was afforded, for the first time, the opportunity of definitely observing the behavior of the human gall bladder and noting whether or not there was stasis present as compared to normal. It is of interest that recently Mann and Higgins¹² in animal experiments, using 40 per cent iodized oil, found that pregnancy consistently delayed the emptying time of the gall bladders and that balloons the size of the gravid

*Read at a meeting of the Chicago Gynecological Society, June 22, 1928.

uterus affording the same pressure upon the gall bladder as does the gravid uterus failed to cause this delayed emptying time.

This is, to me, the first scientific demonstration of the so-called stasis (excepting Westphal¹⁹) which appears during pregnancy. My personal experiences with exactly the same experiment in a large series of guinea pigs have failed to give such consistent results and can supply no conclusions. Whitaker and Emerson tried this same experiment in pregnant cats and found that iodized oil would drain out of the gall bladder during pregnancy if the animals were in good condition. In general this would be my conclusion from my animal experimental work.

While this was being done, however, it seemed advisable to attempt, among our prenatal dispensary patients, the visualization of the gall bladders and, providing stasis was present, to determine the effect of fat meals upon their emptying time. In addition to these dispensary patients others were available and were used in the same experiment. Unfortunately the oral method of cholecystography had to be used as the danger of inducing abortion in ambulatory patients from possible reaction to the dye injected intravenously could not be hazarded.

Any patient who vomited was omitted from this series, thus making certain that the dye was ingested in all cases recorded. Failure to visualize the gall bladder then rested upon failure of the dye to reach the gall bladder or its inability to concentrate sufficiently to cause the dye to cast a shadow. Failure to absorb the dye from the gastrointestinal tract must be considered. This is an important factor which would cause failure of visualization of the gall bladder, especially since the dye is absorbed practically entirely in the ascending colon and constipation, which is so frequently associated with pregnancy, hinders dye absorption. The secretory power of the impaired liver, which is undoubtedly adequate in healthy ambulatory women, cannot be considered as a cause of failure. The point of interest was: Would the bile be able to enter the gall bladder, or would the cystic duct be obstructed; was stasis present, and if it were present, could it be alleviated by stimulating the gall bladder into draining its contents by the customary fat meal?

TECHNIC

Bromeikon was used in twenty-three dispensary patients. Its continued use was the control afforded by the fact that over 80 per cent of the patients with an upper abdominal lesion, which was suspected in the gall bladder or gastrointestinal tract, gave an excellent gall-bladder shadow. The dosage of bromeikon was five grains in gelatin capsules per twelve pounds of body weight; all patients who were nauseated enough to vomit were eliminated. In addition to these twenty-three patients receiving bromeikon, twenty-three other pa-

tients were given iodeikon, a dye equally as reliable, four of the patients receiving the dye intravenously. The other patients were given 3 gm. of sodium tetraiodophenolphthalein in a colloidal suspension as described by Fantus,⁵ a method which gives about 90 per cent gall-bladder visualization in nonpathologic gall bladders.

CHOLECYSTOGRAPHY RESULTS

Iodeikon	Failed to visualize -----	17	
	Visualized -----	6	
Bromeikon	Failed to visualize -----	16	7
	Visualized -----		
Sodiumtetral in colloid	Failed to visualize -----	9	1
	Visualized -----		
Sodiumtetral intravenously	Failed to visualize -----	1	1
	Visualized -----		
	Total failing to visualize -----	43	
	Total visualizing -----	15	

Duration of pregnancy in visualized cases, average $5\frac{1}{2}$ months.

Duration of pregnancy in nonvisualized cases, average $6\frac{1}{2}$ months.

From the tabulated results, the first significant feature is the surprisingly high percentage of failures in gall bladder visualization. Only 22 per cent of our patients gave a visible shadow, as contrasted to our controls in which 20 per cent did not give a shadow (reversal of results). Moreover, it is of interest that the percentage of failures increased as pregnancy continued. In the case in which pictures of successive months are shown, there is a definitely fainter shadow in the second picture. Moreover, it was of special interest that no gall bladder shadow was obtained after seven and one-half months of pregnancy, although fourteen were attempted; four patients who gave excellent gall bladder shadows in the fourth and fifth months failed to visualize in the seventh and eighth months. Gall bladder shadows were obtained in fifteen cases and following a fat meal (supplied to all patients by the university dining room, consisting of an eggnog containing two eggs, half a glass of cream, and butter fat); it was noted that the gall bladder consistently emptied in time accepted as normal for nonpregnant individuals.

COMMENT

An explanation of the high percentage of failures in the visualization of the gall bladder can only be attempted. Perhaps the factor is present during pregnancy which Orator¹² believed present in definitely surgically established duodenal ulcers which showed at operation normal gall bladders but still in 60 per cent of the cases showed defective gall bladder shadows. This is explained by a hypersecretion present even in fasting state which stimulated emptying of the gall bladder pre-

venting concentration of sufficient dye to cast a shadow. Perhaps this is also a factor in pregnancy. Colonic stasis may explain the failure to fill of this high percentage of gall bladders, but it cannot explain



Fig. 2.—Same patient as in Fig. 1, but two hours after fat meal and twenty hours after ingestion of dye, smaller and fainter shadow than in Fig. 1.

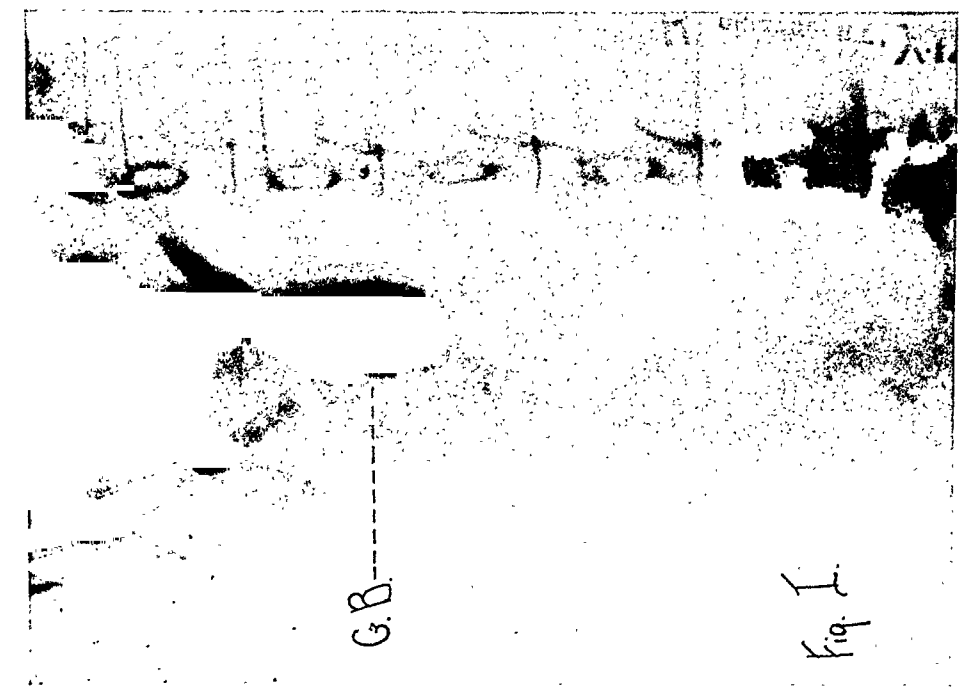


Fig. 1.—Patient, N. K., in fifth month of pregnancy, seventeen hours after oral ingestion of dye, excellent gallbladder visualization.

the high percentage of failure when the dye was injected intravenously. But I do not feel that four cases afford the slightest basis for an opinion on this subject of cholecystography which together with the physiology

of pregnancy would be too extensive a subject for this paper. What was of prime interest to us was the response of the gall bladders which were visualized.

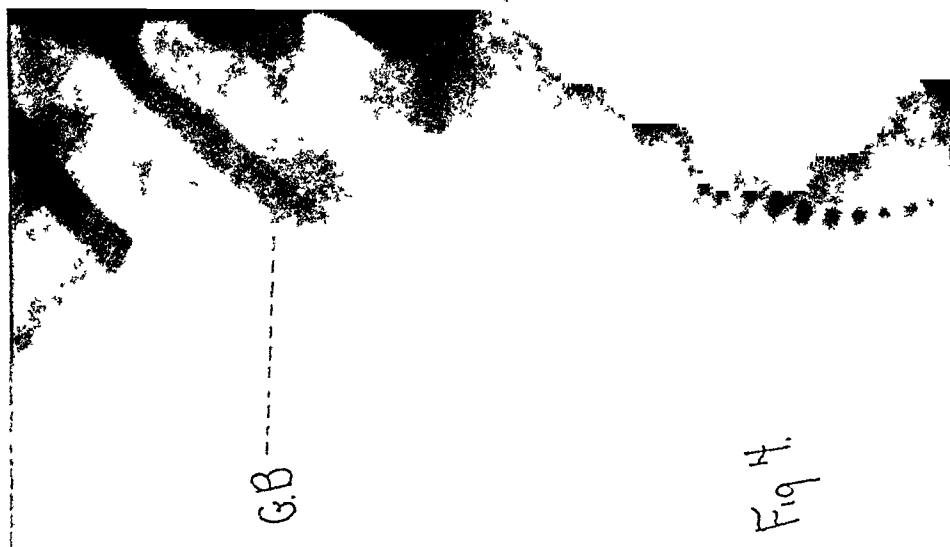


Fig. 4.—Same patient as in Figs. 1, 2 and 3, eighteen hours after ingestion of dye, shadow now visible is much fainter but of same size as in Fig. 1, even though fetal parts are visible and there should be some pressure upon the gall bladder from the uterus.



Fig. 3.—Same patient as in Figs. 1 and 2 but now in sixth month of pregnancy. Fifteen hours after ingestion of dye no visible shadow although same amount of dye was ingested as in Fig. 1.

Every gall bladder visualized responded to a fat meal in a normal fashion. Three hours after the fat meal the gall bladders were practically empty regardless of stage of pregnancy. Fig. 2 shows excellent

response in fifth month of pregnancy; Fig. 4 in sixth month and Fig. 8 in seventh and one-half month of pregnancy. Had stasis been present, these shadows would have become more dense with the concentration

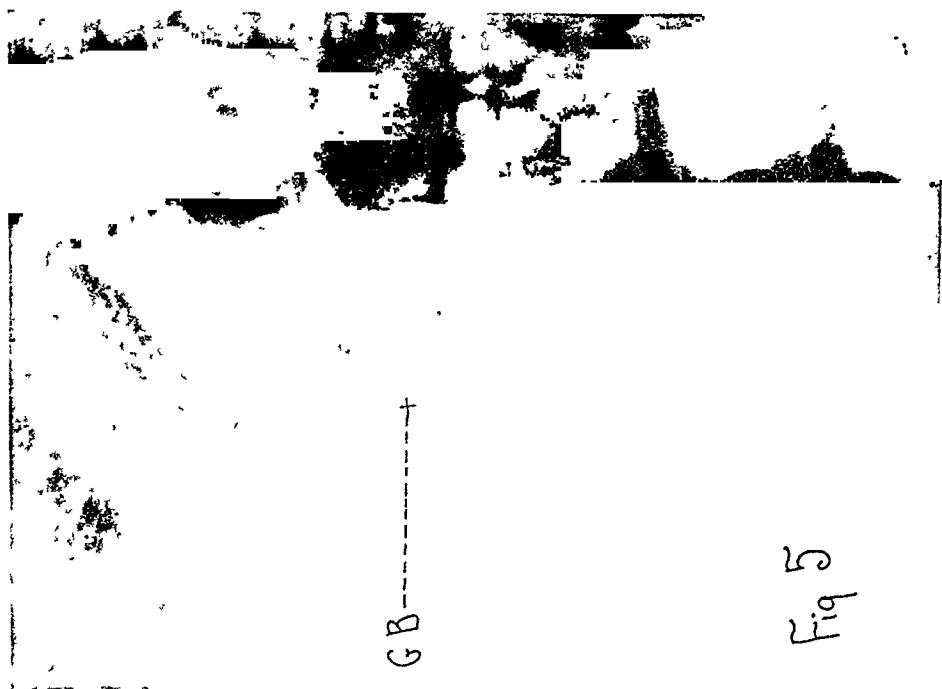


Fig. 5.—Patient, E. E., in fourth month of pregnancy, seventeen hours after oral ingestion of dye, faint large shadow.



Fig. 6.—Same patient as in Fig. 5, two hours after fat meal and twenty hours after ingestion of dye, shadow almost gone.

of the dye. Now that Ivy⁹ has shown that the gall bladder will respond to an acid extract of the duodenum, it is reasonable to expect better and more rapid response than was obtained by fat meals.

Of further interest was the shape of all the gall bladders visualized. None of them showed any evidence of mechanical pressure from the growing uterus. The gall bladder seen in Fig. 4 is approximately the

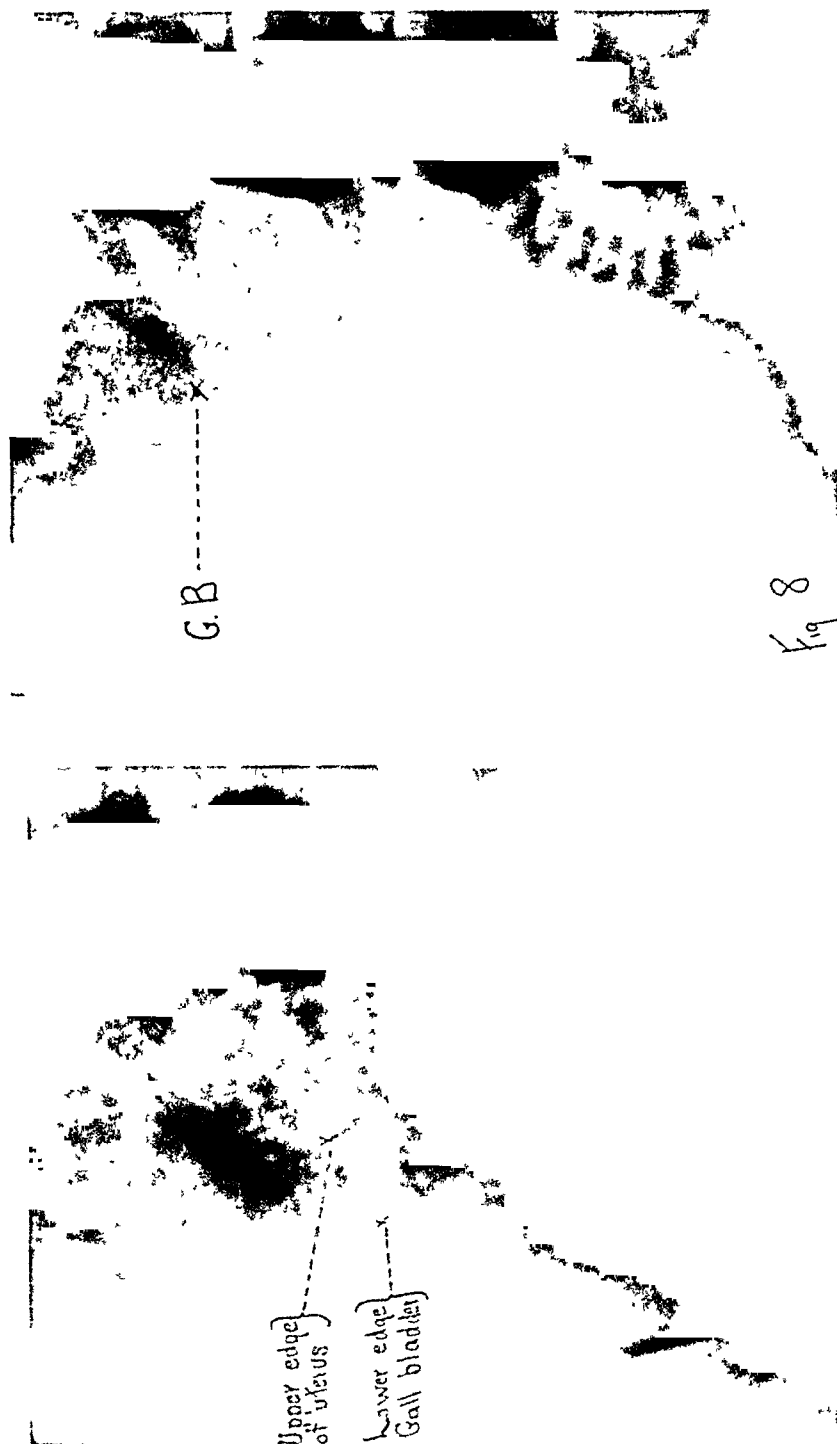


Fig. 8.—Same patient as in Fig. 7, two hours after fat meal and twenty hours after ingestion of dye, shadow practically gone.

Fig. 7.—Patient, A. H., about seven and one-half months pregnant, large but faint shadow of gall bladder fourteen hours after ingestion of dye. Note that although uterus has risen above the lower border of gall bladder there is no pressure defect in the latter.

same size as that seen in Fig. 3, despite the fact that the uterus had grown to the level of the umbilicus during the six weeks' interval between the two pictures. The gall bladders seen in Figs. 7 and 8 are

of unusual interest as here, particularly in Fig. 7, the upper border of the uterus can be seen to extend higher in the abdomen than the lower border of the gall bladder without any apparent mechanical pressure or x-ray defect in the gall bladder shadow.

This was true in every case in which a gall bladder shadow was obtained and in which the uterus was high enough in the abdomen to reach the gall bladder. It is inconceivable to me that any pressure which is insufficient to disturb the outline of such a soft organ as the gall bladder can be much of a factor in the development of stasis.

CONCLUSIONS

1. Positive Graham-Cole gall bladder tests in pregnancy (the failure to visualize) should be skeptically accepted as proof of gall bladder pathology.

2. Stasis in the gall bladder of pregnancy was not seen in the gall bladders visualized in this experiment.

3. What stasis may be present is certainly combated by the response of the gall bladder of pregnancy to fat meals.

4. Even when the gravid uterus rises above the lower gall bladder border, it does not exert enough pressure to disturb the normal gall bladder outline.

I wish to thank my colleagues, Dr. Bronson and Miss Falk, at the Northwestern University Medical School, whose assistance made this work possible.

REFERENCES

- (1) *Boyden, E. A.*: Anat. Rec. 30: 333, 1925. (2) *Burget, G. E.*: Am. J. Physiol. 74: 583, 1925. (3) *Cannon, W. B.*: Mechanical Factors of Digestion, New York, 1911, p. 48. (4) *Copher, Kodama and Graham*: J. Exper. Med. 44: 65, 1926. (5) *Elman, R., and McMaster, P. D.*: J. Exper. Med. 44: 151, 1926. (6) *Fantus, B.*: J. A. M. A. 89: 182, 1927. (7) *Friedenwald, Feldman and Kearney*: Radiology 9: 68, 1927. (8) *Graham, Cole and Kodama*: Am. Surg. 84: 343, 1926. (9) *Heyd, C. H.*: M. Rev. of Rev. 32: 600, 1926. (10) *Ivy, A. C., and Oldberg*: J. A. M. A. 90: 445, 1928; Proc. Soc. Exper. Biol. & Med. 30: Nov., 1927. (11) *Jacobson and Gydesen*: Arch. Surg. 5: 1922. (12) *Mann and Higgins*: Arch. Surg. 15: 552, 1927. (13) *Orator, V.*: Deutsche Ztschr. f. Chir. 205: 82. (14) *Peterson, Reuben*: Surg. Gynee. Obst. 11: July, 1910. (15) *Rous, P., and McMaster, P. D.*: J. Exper. Med. 34: 47, 1921. (16) *Seitz, L.*: Zentralbl. f. Gynäk. 11: 954, 1926. (17) *Schmid, Hans Hermann*: Arch. f. Clin. Chir. 125: 121, 1923. (18) *Stewart and Ryan*: Am. J. Roentgenol. 16: 234, 1926. (19) *Westphal*: Ztschr. f. klin. Med. 96: 22, 1923. (20) *Whitaker and Emerson*: Am. J. Physiol. 84: 516, 1928.

(For discussion, see page 731.)

A STATISTICAL AND CLINICAL STUDY OF ONE THOUSAND CASES OF STERILITY*

By DONALD MACOMBER, M.D., BOSTON, MASS.

IT IS the purpose of this paper to discuss as briefly as possible an analysis of one thousand cases of sterility. The cases are taken entirely from the private practice of the writer and of his partner Dr. Edward Reynolds. They are consecutive cases up to and including April 1, 1928, and are absolutely unselected.

It will perhaps be wise at the start to mention some of the difficulties which attend an attempt of this kind. In the first place the numbers are not sufficiently large as far as some of the smaller groups are concerned to be significant. At the present time there is no remedy for this. The writer has already deliberately waited several years until the total cases accumulated should exceed a thousand so that this defect might be remedied as far as possible. To any student of the problem it is evident that as a rule private patients are the only ones willing to spend the time and undergo the discomforts necessary to a complete investigation. For this reason statistics from out-patient clinics are rarely of any value. Another difficulty arises from the fact that for many years these records were taken without thought of a possible study. Hence the negative data have often been omitted, making the compilation of tables extremely difficult. Furthermore the writer cannot lay claim to a mathematical or biometric background such as is an essential for an undertaking of this kind.

These difficulties would seem sufficiently great in any ordinary medical study, but in sterility there are others inherent in the subject itself which must be faced if not overcome. In medicine a clinical entity can be classed and described under one name; in sterility, however, our patient is not a single individual but a couple, each one of whom may be a distinct problem. They cannot be classed as individuals since it is only in their relationship that sterility arises. In medicine we like to limit our diagnosis to a single disease or pathologic process and usually we can do so. But in sterility it is extremely common to find a number of conditions (e.g. retroversion and obesity) existing in the same patient either one of which might be sufficient to produce sterility, or again we may find pathologic conditions with both husband and wife (e.g. endocervicitis and prostatitis), either one of which would similarly be an adequate finding.

*Read (by invitation) at a meeting of the New York Obstetrical Society, November 13, 1928.

For lack of space it has been found necessary to abridge this article. The complete paper may be had in the author's reprints.

This brings me to a part of the problem which is most often misunderstood by patients and even by doctors themselves, that is the diagnosis of sterility—the giving a name to the condition which is causing the failure to reproduce. The difficulty can best be illustrated by giving a typical case history opinion as given to a couple who have been examined for inability to have children.

* * * *

In the first place patients must realize that certain pathologic conditions, whether remediable or not, may give rise to absolute sterility in an individual. By far the larger proportion of individuals, however, are not sterile though they may show some pathologic condition. If there is only one in either partner, classification becomes easy, and it may be confidently asserted that fertility has been reduced by this pathologic condition and that if it is susceptible of removal there is reason to believe that fertility will return to normal. In practice, however, it is rare to find only a single pathologic condition. We may find a badly lacerated cervix and a retroverted uterus, or, as in the illustration, some metabolic disturbance with overweight, scanty periods, anemia, etc., on the one side, and a mild catarrhal condition of the prostate with overwork on the other. At this point it is well to emphasize the fact that there is no pathologic condition, except such obvious things as closure of the tubes or of the vasa deferentia, or something of the sort, in which pregnancy has not been known to occur however infrequently. The best way in which to think of the relationship of some pathologic condition to fertility, as for instance that of retroversion, is to say that given a hundred cases of the particular lesion in question the incidence of conception would be reduced over what occurs in normal women to a greater or lesser degree.

The best hypothesis that we have been able to put forward to explain sterile marriages under conditions of this sort is the one which we proposed in 1920 of relative fertility.¹ We believe that the fertility of an individual (and following Raymond Pearl² this should probably best be called fecundity and the term fertility be limited to the description of a mating) can be represented on a percentage basis. There are few individuals who are 100 per cent. The fecundity of most for one reason or another would be considerably less, often much less. With the man by counting the number of spermatozoa per cubic centimeter in the semen and other similar quantitative tests we have actually been able to make such estimations. With the woman the difficulty is vastly greater. No one has ever seen a live human egg cell after it has left the ovary except at operation. However, by careful and thorough examination and evaluation of such functional data as those of menstruation, acidity, size of ovaries, etc., it is possible to make a reasonable guess.

The chance for having children, or the fertility of the marriage, we believe to be best approximated by multiplying the fecundities of hus-

band and wife. If the resultant figure is much below 50 per cent, we do not expect children. If it is much above we almost invariably have them. There is of course a doubtful region in the neighborhood of 50 per cent where children may, or may not, come but where the chance for miscarriage due to defective germ plasm is greatly increased.

This hypothesis explains cases similar to the one quoted above, but it does not help us very much when we come to make a classification of cases on any pathologic basis. I am inclined to believe that such a pathologic classification is of little real value and that the time will come when all cases will be classed from a physiologic point of view only. At the present time we simply do not know enough to make this sort of classification. There is therefore nothing else for us to do but to make the best of a bad situation.

The classification of pathologic diagnoses must in the nature of the case be an artificial one. If all the items of diagnosis are listed separately we will have a total many times the actual number of cases. Such a list could give us no possible conception as to which pathologic conditions were of greater importance in reducing fecundity. On the other hand if we simplify to a single diagnosis in the case of an individual, we will miss those associated factors which undoubtedly influence the net result; furthermore we at once come to the difficulty that both partners may be equally responsible in the causation of the sterile marriage.

* * * *

What then shall be the method of classification which will give the most accurate representation of conditions as they actually exist? I believe that there is no absolutely perfect method but that the one suggested by Dickinson and Cary with certain changes will come nearer to the truth than any so far devised. The older methods have a certain utility and for that reason they will also be used in reporting this series. With the earlier cases it is the only possible method, since accurate methods of semen examinations have only been used for some three hundred cases. In practically every case in this whole series something was known of the fertility of the husband. The methods used in determining this did not lend themselves to accurate tabulation; for instance, many depended on the Hühner¹² or postcoital test. This we have since found to be inadequate as a means of diagnosing male fertility though it still retains its place as a test of function. With the last three or four hundred cases we have figures in regard to the semen for each diagnosis with the woman whether normal or pathologic.

Having now discussed the difficulties of classification let me turn to the even greater difficulties inherent in the reporting of the results of treatment. What is to be the criterion of whether a case is to be recorded as a success, a failure, or one which has not been treated at all?

Up to the present time only three authors have reported their results with any large series of cases. As has been already noted Polak⁵ in 1916 reported a series of 798 cases, Hunner and Wharton¹⁰ in 1924 a series of 526, and Dickinson and Cary¹¹ in 1927 a series of 788. In each instance a large proportion of the total cases had to be excluded for one reason or another. The authors were not always clear as to the exact reason why these exclusions were made, and this must necessarily impair the value of their conclusions. Rather than begin by cutting down the total number of cases for this reason or that, while keeping intact the number of successful ones, it has seemed fairer to give in all instances the crude statistics first; number of cases seen and number of pregnancies. Next the result of the pregnancy should where possible be included as full term, miscarriage, or blighted ovum. Then, and only then, may the hopeless or untreated cases be excluded.

* * * *

We now come to the actual classification of the 1070 case histories on which this report is based. It must be remembered that the diagnoses would undoubtedly be different in many of the earlier cases had they been examined by modern methods. Where, however, definite pelvic pathology was found, and this was almost always the case with these earlier patients, the chances are that that diagnosis is correct. It is only when an attempt is made to correlate this with the causes of the sterility that an error is likely. The first, and one of the most natural attempts at the classification, is to divide up the cases according to whether they were chiefly of male, female or combined origin. The total result is that there were 197 pure male cases, 619 female cases, and 186 cases where both husband and wife were at fault; 68 were incomplete.

From one point of view the males should undoubtedly be held even more responsible for the occurrence of sterility than has been our habit in the past. We have long believed that nonvenereal infections of the male tract could be transmitted to the woman and have recently made a statistical study of the last 642 cases having a complete male history, and where the presence of genital infection in either husband or wife could be demonstrated. We found such infection present in 104 men and in 34 of their wives, a proportion twice as great as the proportion in which pelvic infection in the woman occurred in relation to the total number of cases (18 per 100). It seems to us that this is altogether too large a proportion to be accounted for on any chance basis, and we believe that there must therefore be a relationship between these two facts.

The simplified diagnoses have been combined in Table I by choosing what seemed to be on final analysis the single most important element in the case in relation to the causation of sterility. This cannot help giving a false impression to a certain extent, particularly in regard to simplicity. As a matter of fact cases are far more complex than are

TABLE I. DIAGNOSES

ITEM	FEMALE AND COMBINED DIAGNOSIS	NUMBER	PERCENTAGE OF TOTAL DIAGNOSES	MALE FERTILITY (SPERM COUNT)				
				0 - 25	25 - 50	50 - 75	75 - 100 OR MORE	
1	Cervix (mechanical injuries, stenosis, hypertrophy, etc.)	33	3.1%	1	3	3	3	3
2	Cervix, antelexion	88	8.3%	1	8	5	4	4
3	Cervix, endocervicitis	55	5.2%	2	7	10	9	9
4	Uterus, underdeveloped, double, endometritis	51	4.8%	3	1	6	9	9
5	Uterus, fibroids	56	5.2%	5	4	2	4	4
6	Uterus, retroversion	138	12.9%	2	15	12	15	15
7	Tubes, closed	144	13.4%	3	7	11	16	16
8	Ovaries, cystic	97	9.1%	2	6	6	12	12
9	Congestion	44	4.1%	2	2	2	7	7
10	Age	15	1.4%	1	2	0	2	2
11	Obesity	52	4.9%	0	4	15	14	14
12	Underweight	10	0.9%	0	1	2	5	5
13	Anemia	16	1.4%	0	1	1	6	6
14	Miscellaneous	6	0.6%	0	0	1	4	4
15	Female, normal Male diagnosis	197	18.3%	49	20	12	15	15
	a. Vesiculoprostatitis	57	5.3%	8	12	7	13	13
	b. Varicocele	7	0.7%	3	1	2	0	0
	c. Developmental defects	3	0.3%	1	1	0	0	0
	d. Oligospermia	45	4.2%	2	3	1	0	0
	e. Aspermia	44	4.1%	30	0	0	0	0
	f. Gonorrheal epididymitis	4	0.4%	3	0	0	0	0
	g. Age	1	0.1%	0	0	0	0	0
	h. Impotence	16	1.4%	0	0	1	1	1
	i. Constitutional	20	1.8%	2	3	1	1	1
16	Incomplete	68	6.4%	0	0	0	0	0
	TOTALS	1070	100.0%	71	81	88	125	125
	Male 197.	Female 619.	Combined 186.	Incomplete 68.	Grand Total 1070.			

here indicated. The table is useful in giving a bird's-eye view of the whole subject. It will be noticed at once that the number of cases in which male fertility has been determined for each female diagnosis falls far short of the total. The reason for this is that we have only listed those cases as far as fertility is concerned in which an actual sperm count had been made, believing that previous methods were too inaccurate to warrant classification. It will be understood that for mechanical reasons the male diagnosis must be omitted unless the female diagnosis is normal, but in those cases where the female diagnosis is given alone the functional condition in the male is noted for those cases in which a sperm count is recorded. If one is interested in the woman alone, one must read instead of the 197 cases where the male diagnosis is given alone, female normal. On the other hand, if one is interested in the male alone, it can be said that there were 619 normal men as far as any pathology was concerned though their fertility varied a good deal according to individual circumstances. There were 197 in which the pathologic diagnosis is given, and there were 186 more in whom some trouble was found, the nature of which could not be indicated in the table, but which was similar to the list given for the 197 straight male cases.

In order to correct the false impression given by Table I it is necessary to give further details about each item.

Under Item 1, cervix, there are 1 case of absolute stenosis, 20 cases of laceration, 3 cases of laceration in which congestion was also an important element, 8 of laceration with retroversion, and 1 of hypertrophy. This makes the total given of 33. In addition there was 1 case of lacerated cervix where fibroids were also present, but this was listed under fibroids so that there might not be a duplication of diagnoses. This same system will be followed in recording each of the other items listed in Table I, namely, the total will be given as in the table showing how it has been made up, and then additional diagnoses will be listed in the body of the paper in which that same condition was present but where because of some other more important condition that particular series of cases was listed in the table under another diagnosis.

Item 2. Cervix, antelexion. There were 60 cases of simple antelexion, 15 of which had what is called pinhole os. There were 28 additional cases which had a mild endocervicitis, but in which the endocervicitis seemed to be directly secondary to the antelexion. These totaled the 88 shown in the table. Additional cases in which antelexion was a partial factor were antelexion and ovaries 39, antelexion and tubes 6, antelexion and fibroids 4.

Item 3. Cervix, endocervicitis. Fifty-five cases as listed, but with additional cases in which the endocervicitis was of secondary impor-

tance as follows: endocervicitis-cystic ovaries 7, endocervicitis-fibroids 1, endocervicitis-congestion 4, endocervicitis-anteflexion 28, endocervicitis-retroversion 3.

* * * *

Item 11. Was made up of 52 cases, all of which were obese and complained of scanty menstruation. Many had poor diets; many had low metabolism. Cases listed under this item and under Item 12 and a good many under Item 13 would by many be listed as cases of endocrine disturbance. With our present inadequate knowledge as to the real underlying causes they have been grouped in the manner indicated.

Item 12 consisted of 10 cases which were markedly underweight and had scanty menstruation as well. There were of course many other cases showing underweight or overweight, but since menstruation was normal in these they were not included here. The total of these cases is shown in Table II.

Item 13 consisted of 16 cases of anemia of sufficient severity to affect menstruation and therefore presumably fertility. Here again there were, of course, many other cases where anemia was a factor.

Item 14 was made up of 6 cases, 1 of which was a severe case of diabetes, severe enough in the opinion of the writer to be a cause for sterility. The other 5 cases were negative as far as any gross pathology of either husband or wife was concerned, but the wives all showed quite extreme nervousness of one kind or another sufficient to include them in the psychoneurotic group. All the rest of the cases were entirely male.

Item 15 *a* was made up of 57 cases of vesiculoprostatitis, in some of which the prostate predominated, but in others of which the vesicles were involved either alone or in combination with the prostate. This does not represent the total of these cases which were seen. As has been said the husbands were partially at fault in 186 of the 805 cases which had been listed in items 1 to 14 inclusive, and some of these had vesiculoprostatitis. These same remarks apply to the other sub-items under 15.

Item 15 *b* consisted of 7 cases of varicocele so severe as seriously to affect fertility. This will be obvious in observing the sperm count, two-thirds of which were less than half the normal.

Item 15 *c* was made up of 3 cases showing developmental defects, 1 a hypospadias and 2 cases of undescended testicles.

Item 15 *d* consists of 45 cases of oligospermia. This is admittedly a failure of complete diagnosis and classification. It is made up chiefly from the earlier cases so that the cause of the oligospermia was unknown. It is obvious from a perusal of the male fertilities recorded in Table I that oligospermia (if one may define it as showing a sperm count of less than 50,000,000 per cubic centimeter) represents a very large proportion of the total. For instance, excluding the

aspermias, there are recorded in Table I 335 sperm counts, of which 122 (36.4 per cent) fall in this group. Needless to say these cases have in the actual records been thoroughly diagnosed as far as our present knowledge will permit.

Item 15 *e* included 44 cases of aspermia. This represents the total number of these cases without regard to causation. As far as is known the etiology of these cases was as follows: Gonorrhea 18 cases, 47.4 per cent; undeveloped 7 cases, 18.4 per cent; mumps 5 cases, 13.2 per cent; varicocele 3 cases, 7.9 per cent; secondary to poor condition 3 cases, 7.9 per cent; syphilis 1 case, 2.6 per cent; and x-ray 1 case, 2.6 per cent. The rest were unexplained.

Item 15 *f* is 4 cases known to have had gonorrheal epididymitis but in which a few spermatozoa were found.

Item 15 *g* consists of 1 case where the sterility was due to the fact that the man was over seventy years old.

Item 15 *h* is made up of 16 cases of impotence where this was so complete as to be an absolute cause for sterility. It so happened that we were able to get sperm counts on two of these cases by examining a nocturnal emission and found that as far as numbers were concerned they were not much below the average.

Item 15 *i* is a miscellaneous group of 20 patients made up of 6 cases of syphilis, 4 cases of diabetes, 2 cases of chronic nephritis and 8 which were without pathology but were so seriously overweight or underweight that fertility had been affected.

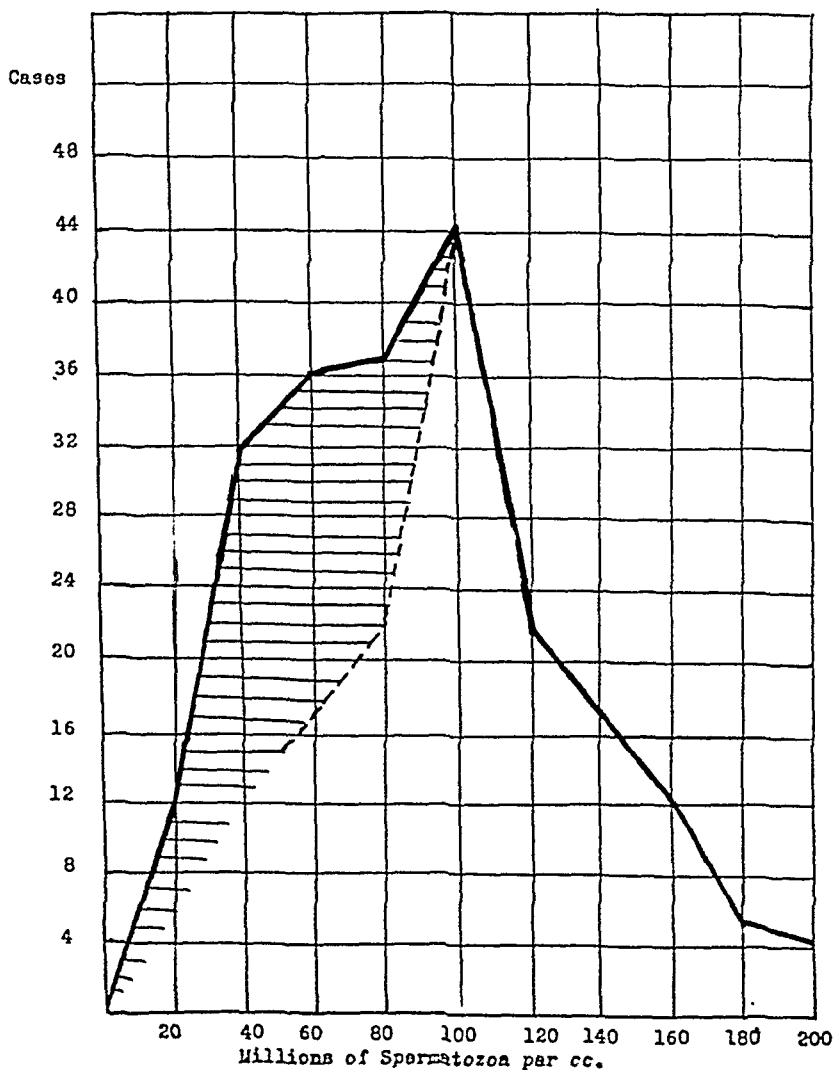
This completes an amplification of material shown in Table I. The percentage occurrence is given after each item. The sum of items 15 *a* to *i*, 197 or 18.3 per cent, represents the number of normal women seen in this series, although it should be said that many of the others deviated only very slightly from the normal.

TABLE II. UNDERWEIGHT AND OVERWEIGHT FIGURES FROM THE EXAMINATION OF 730 COUPLES

POUNDS	UNDERWEIGHT		OVERWEIGHT	
	WOMEN	MEN	WOMEN	MEN
5-9	10	2	13	3
10-14	52	22	33	19
15-19	31	16	37	15
20-24	18	14	34	25
More than 25	19	19	70	47
Totals	130 (17.1%)	73 (10%)	187 (25.6%)	109 (14.9%)

Most of the other tables need little comment. It is interesting, however, to note from an examination of Table II that in general the women deviate from normal to a much greater extent than the men in both directions, though those who are overweight distinctly predominate. The well-known correlation between obesity and sterility receives striking confirmation from these figures.

Fig. 1 shows in graphic form the results of the spermatozoa counts. The cases of aspermia have been left out as they would obviously spoil the symmetry of any curve. The solid line represents the counts of normal and abnormal individuals. It is obvious that the shaded portion at least is due to the fact that while this curve is made up from a certain number of normal individuals, it also included many abnormal ones. It is probable that the dotted line taken in connection with the right hand portion of the curve would more nearly correspond to



normal. This curve would have a median in the neighborhood of 100. This curve represents the combined figures from all the spermatozoa counts noted in Table I.

We come now to what is the most important and at the same time the most difficult part of such a statistical study of cases as we are dealing with in this paper, namely, a consideration of the actual results which have been obtained. It is here that there is the greatest chance for error to creep in, or for the bias of the one who is reporting the statistics to affect the net result. It is the belief of the writer of

this paper that anyone making such a report of his personal successes and failures, particularly where the subject is one of sterility, should make it absolutely clear just what he is reporting as a success and whether there has been any selection used in regard to the statistics on which the percentage of success is calculated.

In this paper all successes which have followed treatment are classified according to whether the pregnancy went through to full term, whether it ended in a miscarriage in which there was absolute proof that a pregnancy had taken place through the finding of a fetus or positive evidence of pregnancy through microscopic examination, or whether there was a blighted ovum in which case both patient and doctor had every reason to believe that pregnancy occurred but where there was no microscopic evidence. In this paper also the crude statistics are quoted first and any corrections which have been made are plainly indicated so that there can be no misconstruction whatever.

Out of the 1070 cases there were 208 full-term pregnancies (Table III), 28 miscarriages and 11 blighted ova, making a total of 247 pregnancies or 23.1 per cent. For full-term pregnancies the percentage is 19.4 per cent. These are the crude statistics, but they obviously give an incorrect expression of the facts even without any selection of cases whatever. The chief reason for this lies in the fact that it always takes a considerable period of time after treatment has been instituted before there can be any hope for a pregnancy. For instance, our records show that the greatest number of pregnancies following abdominal operations do not occur until about a year afterward on the average. The time is somewhat less after an operation where the abdomen does not have to be opened but is still a good many months, and even office treatment on account of various delays and in the very nature of the case takes time. For that reason without any selection whatever of the cases it seems fairer in calculating percentage of success to omit all the cases seen in the past year and to omit from the successes all those which may have occurred during that year on those particular cases. This automatically reduces the total number of cases to 960 and at the same time the full-term successes by 7 to 201, the miscarriages by 1 to 27, and the blighted ova not at all. To repeat, then, leaving out the cases seen in the last year from April 1, 1927, to April 1, 1928, there was a total of 960 cases with 201 full-term pregnancies resulting, giving a percentage of 20.9 or of 24.9 if miscarriages and blighted ova are included as well. These figures, it will be understood, are completely unselected; they merely cover the cases seen up to April 1, 1927, with all pregnancies which are known to have occurred in them up to April 1, 1928.

So much for the figures without selection, but it does not seem unreasonable to make certain selection because of the nature of the cases from which the figures have been taken. In the first place up to

April 1, 1927, there were 62 incomplete case records where the examination was never finished and no diagnosis or treatment given. Then there were 41 cases of aspermia previous to that date, and it seems reasonable to exclude these also. There were also 15 women whose age was so much over forty as to make it practically impossible for them to conceive and 1 man over seventy. These 16 cases may therefore also be subtracted. There were 5 cases of severe diabetes and 2 of severe chronic nephritis. These deductions total 126, and when subtraction has been made from the 960, the result is 834. Figured on this group of selected cases the full-term pregnancies amount to 24.1 per cent, and the total 28.8 per cent.

There is a great danger in excluding so-called hopeless cases since there are occasional successes with even the most hopeless appearing. It is obvious from a perusal of Table III, where the successes are grouped by diagnosis and the percentage success figured, that there is a much better chance of relieving some conditions than others. For instance, four-fifths of the cases recorded as simple congestion in which there was a functional disturbance without any pathology whatever eventually had pregnancies, even though reference to Table I shows that some of these cases were married to husbands of low fertility. On the other hand Item 7, closed tubes, shows only about one successful outcome in ten even though a large proportion of the husbands were of high fertility. Most of the other diagnoses have between 20 and 30 per cent successful cases. With the understanding then that any method of hopeless case selection is open to grave objection the following extreme cases may be noted: completely infantile uterus associated with amenorrhea 5 cases, entire degeneration of the ovaries with complete stenosis of the cervical canal and long continued amenorrhea 1 case, carcinoma of the ovary 1 case, extensive fibroids and amenorrhea in a woman over forty 1 case, fibroid uterus necessitating hysterectomy 2 cases. The remaining 22 cases came from Item 7 closed tubes. The condition in each case was proved by operation; double tubercular salpingitis 7 cases; pelvic inflammation involving tubes, ovaries and uterus so extensive that pregnancy was hopeless, and in all of which double salpingectomy had to be performed, 10 cases; 3 cases in which double salpingectomy had already been performed and nothing remained of either tube; 1 case of extensive pelvic inflammation which necessitated hysterectomy; 1 case of carcinoma of the tubes. These cases totaled 32. If they are subtracted from the 834, 802 cases are left with 201 full-term pregnancies, which is 25 per cent, or if the percentage is figured for the total number of pregnancies, including miscarriages and blighted ova, the result is 29.4 per cent.

An examination of the figures shown in Table III, gives an idea, though of course only an approximate one, of the likelihood that there

TABLE III. SUCCESSES BY DIAGNOSIS.

ITEM	DIAGNOSIS	TOTAL NUMBER CASES	PERCENTAGE FULL-TERM PREGNANCIES OF TOTAL CASES	FULL-TERM PREGNANCIES	MISCARRIAGE TUTAL PREG- NANCIES	BLIGHTED OVUM	TOTAL PREGNANCIES
1	Cervix, laceration	33	33.3	11	0	1	12
2	Cervix, antelexion	88	19.2	17	0	0	17
3	Cervix, endocervicitis	55	29.0	16	1	2	19
4	Uterus, underdeveloped, dou- ble and endometritis	51	15.7	8	0	1	9
5	Uterus, fibroids	56	17.9	10	5	0	15
6	Uterus, retroversion	138	23.9	33	1	1	35
7	Tubes, closed	144	7.6	11	4	0	15
8	Ovaries, cystic	97	26.8	26	4	3	33
9	Congestion	44	75.0	33	3	0	36
10	Age	15	0.0	0	0	0	0
11	Obesity	52	19.2	10	5	3	18
12	Underweight	10	40.0	4	0	0	4
13	Anemia	16	12.5	2	0	0	2
14	Miscellaneous	6	0.0	0	0	0	0
15	a to i male	197	13.7	27	5	0	32
16	Incomplete	68	0.0	0	0	0	0
TOTALS		1070	19.4	208	28	11	247

is with our present knowledge of correcting the various conditions listed under diagnosis. As was stated in the preceding paragraph when hopeless, incomplete and absolutely sterile cases are deducted there was an average of 25 per cent of full-term pregnancies. The conditions in which the chance for success is greater than this expected average are Item 1, lacerated cervix; Item 3, endocervicitis; Item 8, cystic ovaries; Item 9, simple congestion; and Item 12, underweight. The following conditions are below the average but relatively close to it: Item 2, anteversion; Item 6, retroversion; and Item 11, obesity. All the rest are much below with Item 7, closed tubes, the worst of all. The three items 10, age, 14, miscellaneous, and 24, incomplete, are zero but have been excluded as noted above. Item 13, anemia, is undoubtedly too low due to the manner of case selection, also items 15 to 23, the male cases, appear too low since they include the 44 cases of aspermia. If these are deducted in figuring the percentage of success, the total is 153, and the percentage of full-term pregnancies is 17.6, which corresponds better with the facts.

In calculating percentages no deduction has been made for the fact that many of the husbands were of distinctly poor fertility. Only the aspermias have been deducted as noted. A very good idea of the character of the fertility of the husbands of those patients listed as items 1 to 14 inclusive in Table I can be obtained by totaling the figures for male fertility which appear opposite these respective items. As has been elsewhere explained, these fertilities are derived from consecutive spermatozoa counts on recent cases. The spermatozoa counts which appear under the male diagnoses Item 15 *a* to *i* are excluded because of the preponderance of low counts due to the nature of the method of selection. Making the totals then as indicated there are 22 where the sperm count is less than 25,000,000 per c.c., 61 where it is between 25,000,000 and 50,000,000 per c.c., 76 between 50,000,000 and 75,000,000 per c.c., and 110 where the count is 75,000,000 to 100,000,000 or more. There are 269 of these counts which would seem to be a fair sample. Reducing the figures noted above to a percentage basis we find that 8.1 per cent of the husbands were very poor, 22.7 per cent were poor, 28.3 per cent fair and 40.9 per cent good. These facts must be taken into account in figuring percentage success, but since the numbers are relatively small no deductions have been made. One can, however, safely say in examining any of the figures shown in Table III in items 1 to 14 that if the cases with husbands whose semen was poor had been eliminated the percentage of success would probably have been 20 to 25 per cent greater. The writer believes, however, that for statistical purposes this is a rather dangerous means of calculating results. Not infrequently a single examination of semen will for one reason or another appear very much poorer than it would some other time; then, too, there are so many unknown factors relat-

ing to fertility that to choose a single one to the exclusion of all others is liable to lead to considerable errors.

In the same way the habit of certain writers in reporting their results of excluding cases which did not remain under their personal care is a very dangerous one since it immediately handpicks the statistics. It is very easy to get a high percentage of success by eliminating all the hopeless cases and treating only those where there was a relatively great chance to effect a cure. Even to limit cases to those seen more than once or twice will give a marked bias to the statistics since many such cases are given advice and proceed to follow it though perhaps not under the immediate care of the physician who gives it. It is in fact extremely difficult to gauge the relative efficacy of different forms of treatment since so many cases can be eliminated on the ground that the treatment advised was not followed.

In concluding this presentation of the results of treatment I wish to call attention to Table IV which gives the results of other writers as far as they have been published. It is possible that there have been other articles on results, but if so they have not come to the attention of the writer. Polak⁵ Hunner and Wharton¹⁰ and Dickinson and Cary¹¹ have reported their results in considerable detail. The last article quotes a number of figures without references stating the results of the curability of certain particular causes of sterility by certain writers. These, however, are so heterogeneous and so entirely unsubstantiated by total figures as to be quite worthless. The table therefore is confined to the three series already mentioned.

TABLE IV. TABULAR PRESENTATION OF PUBLISHED RESULTS OF THE TREATMENT OF STERILITY

AUTHOR	TOTAL CASES	TOTAL PREG- NANCIES	PER CENT SUC- CESSES	FULL-TERM PREG- NANCIES	PER CENT SUC- CESSES
<i>Unselected Cases</i>					
Polak, 1916	798	134	16.8	Not stated	
Hunner and Wharton, 1924	526	91	17.3	81	15.4
Dickinson and Cary, 1927	788	Not stated			
Macomber and Reynolds, 1928	1070	247	23.1	208	19.4
<i>Selected Cases (from the above)</i>					
Polak	427	134	31.1	Not stated	
Hunner and Wharton	363	91	25.0	81	22.3
Dickinson and Cary	73	34	46.0	Not stated	
Macomber and Reynolds	802	239	29.4	201	25.0

The table is divided into two parts according to whether selected cases are used as a basis for calculating the basis of success or not. The percentage calculations are not quotations but were made by the writer from the figures as given in the articles. The basis for selection as given in the second part of Table IV was for Polak's cases the exclusion of 231 cases because the records were incomplete or the

patients failed to return; the exclusion of 64 because of impotence, aspermia, deformed and sluggish spermatozoa, or uncured infection; the further exclusion of 70 women with such gross pelvic pathology as to make pregnancy impossible, and of 6 women with such severe heart disease or diabetes as to render pregnancy inadvisable. The deductions then totaled 371, leaving only 427 out of the total 798 (53.5 per cent) on which to reckon the per cent of successes. Such a drastic culling of cases would seem to give too high a percentage of cures.

Hunner and Wharton¹⁰ are a little ambiguous as to the total pregnancies quoted in the first section. They say that there were 110 pregnancies, but since these were apparently only in 91 patients the latter figure is used. Their method of selection is not entirely clear. They state that 363 cases were treated and 163 eliminated; of this 163, 56 were discarded because the male was sterile, 13 of the women were found to be normal and therefore were not treated, 9 required radical surgery and 56 more would not accept treatment. However, these deductions, peculiar as some of them seem (particularly the excluding of normal women), still leave 29 the reason for whose elimination is not given.

Dickinson and Cary¹¹ state that their statistics are based on the last 300 of 788 cases. They do not, however, state how many of those 300 conceived, but limit their report of successes to those 73 in the practice of one of them who persisted in treatment under his care after a diagnosis had been made. In this admittedly very much restricted group they report 34 or 46 per cent success. Such a method of stating their results would seem rather arbitrary to say the least.

Finally in Table IV there are added the results of the study which has been presented in this paper showing both the unselected statistics and those in which some degree of selection was employed. In presenting them and in concluding this paper the author does not wish in any sense to claim any superior method of diagnosis or treatment, or to set his results against those of any other worker in this field. The results at best are discouraging when considered only from the point of view of percentage success. Such a study is useful only when used to point the way toward greater achievement. It is even more important if it can be employed to promote a better understanding of the etiology of sterility and to show how it can best be prevented.

REFERENCES

- (1) Reynolds, E., and Macomber, D.: *Relative Fertility*, Boston M. & S. J. 186: 380, 1922.
- (2) Pearl, Raymond: *Maine Agr. Exper. Sta. Bull.* 192, 1911; *J. Exper. Zool.* 1910-1921.
- (3) Duncan, Matthews: *Sterility in Woman*, Blakiston, 1884, Philadelphia.
- (4) Kisch, E. H.: *Sterilität des Weibes*, Urban, 1886, Leipzig.
- (5) Polak, J. O.: *A Detailed Study of the Pathological Causes of Sterility With the End Results*, Surg. Gynec. Obst. 23: 261, 1916.
- (6) Giles, Arthur E.: *Sterility in Woman*, Oxford Med. Publications, 1919, London.
- (7) Child, Charles

G. Jr.: Sterility and Conception, Appleton, 1922, N. Y. (8) *Macomber, Donald*: Etiology of Sterility in the Female, From an Analysis of 500 Case Records, Boston M. & S. J. 187: 397, 1922. (9) *Reynolds, E., and Macomber, D.*: Fertility and Sterility in Human Marriages, W. B. Saunders Co., 1924, Philadelphia. (10) *Hunner, Guy L., and Wharton, Lawrence E.*: Sterility, A Study Based on a Series of 520 Patients, South. M. J. 17: 269, 1924. (11) *Dickinson, R. L., and Cary, W. H.*: Sterility, Analysis of Cures and Failures, J. A. M. A. 88: 1, 1927. (12) *Meaker, Sam. R.*: A Working Classification of the Causes of Sterility, Transactions of the Section on Obst., Gyn. and Abd. Surgery of the A. M. A., 1927. (13) *Hühner, Max*: Sterility in the Male and Female, Rebman Co., 1913, New York.

321 DARTMOUTH STREET.

(For discussion, see page 720.)

REACTIONS OF THE PERITONEUM*

BY J. W. KENNEDY, M.D., F.A.C.S., PHILADELPHIA, PA.

TO GIVE any thought to the title of this discussion is to know that volumes may be written on the subject, as reactions of the peritoneum are intimately concerned in the surgical pathology of nearly all intraabdominal lesions; so we can only take up some of the broader principles of the subject as they may influence our conduct of intraabdominal surgery.

Our studies of the peritoneum have been so closely confined to the pathologic lesions of this structure that we have remained unmindful of the histology and true physiologic function of this membrane; indeed, this is too often our error, we content ourselves with the pathologic picture which confronts us and rarely consider what may have taken place as physiologic reactions before the field became a pathologic one.

This reasoning has been responsible for erroneous surgical conduct in many lesions and is probably most seen in reactions of the peritoneum.

To misjudge the function of any organ poorly prepares one to meet the pathologic lesions of that organ; and furthermore, to unarm an organ by stating that it is without defensive function is to place it immediately in the pathologic column when any reaction is seen, although the same may be physiologic or protective.

For many years we have been taught that the peritoneal cavity was a huge lymph sac and that this sac lining or peritoneum was perforated by numerous small openings called stomata and stigmata whose function was that of absorption. We are much concerned with this so-called lymph sac, in so far as it has had a great deal to do with the surgical pathology of nearly all intraabdominal infectious lesions.

It is necessary here to say a word in regard to the three great protecting membranes, covers or linings of our anatomy, namely, the skin, the peritoneum and the mucous membrane of our gastrointestinal

*Read at the Forty-first Annual Meeting of the American Association of Obstetricians, Gynecologists, and Abdominal Surgeons, Toronto, September 10, 1928.

and birth canal. To misjudge the function of any one of these great protectors of our body is often to mistake normal function for pathologic involvement.

In our discussion of this subject we can quickly dismiss the skin as one of the protecting membranes of the body in its relation to abdominal surgery with a few words concerning the relation of the skin to the abdominal incision. In our use of the through-and-through suture in closing the abdominal wall, we feel the suture is not apt to become infected because it has two points of contact with protecting membrane, the skin and the peritoneum, and is thus drained at its two extremities; this is exactly what does take place, and one never sees an exploded incision such as takes place in the infected incisions where the terraced suture has been used.

With the terraced suture little concern is necessary with those sutures which come in contact with either the skin or peritoneum, as these membranes will take care of such local infection; but it is the central sutures placed in the muscles and fascia which are not drained by the protecting surfaces, skin and peritoneum, which give the trouble and produce the exploded incisions. This subject is discussed at length in a monograph entitled *Practical Surgery of the Joseph Price Hospital*, and it is not further pertinent here.

Regarding the mucous membrane as one of the protecting surfaces of our body, we are concerned with this membrane in nearly all the intraabdominal lesions and in most of the infections of the birth canal.

We are much interested in our surgical work with the mechanical function of the mucous membrane, for as long as this membrane is intact there is little harmful absorption; but deface or destroy the mucous membrane of the birth canal or bring about destruction of the mucous membrane of the gastrointestinal canal by infection or interfere with its blood supply by thrombus or mass strangulation, then this membrane becomes a great pathologic absorbing surface or permits absorption to take place from those areas from which the membrane has been effaced.

A difference in the reactions of the mucous membrane and the peritoneum must be contrasted. If the mucous membrane is irritated it has little cellular reaction which would be of a protective nature, therefore its function from the standpoint of protection is largely mechanical. This brings out the teaching necessity of great gentleness as a protection to the birth canal.

When we come to discuss the function of the third membrane or peritoneum, we find that this great surface, nearly that of the entire skin area of the body, not only has a mechanical protecting function but also has a decided cellular reaction which is physiologically protective to a profound degree.

Therefore, in summing up it may be said of these three great membranes, the skin, mucous membrane and peritoneum, that they not only protect our bodies by defining, limiting and repelling infectious agents, but they further define the direction of extension of pathologic lesions, and when taken into account with the great fascial planes which more influence the direction of extension of pathologic fluids through quantity of accumulation, we have an intelligent working basis for most of the surgical lesions of the abdominal cavity and infections of the birth canal.

The peritoneum now most commands our attention. Shall we look upon it as defensive or offensive in dealing with the surgical pathology of intraabdominal lesions?

The popular view today of the surgery of intraabdominal infections is that the function of the peritoneum is offensive and most of the working factors of today's surgery have been established upon that thought and, I feel, very erroneously so. If the peritoneum is to be looked upon as a great absorbing membrane and its reactions to irritation are to increase this absorbing function, then of course its function is offensive, and we can expect little help from its reactions.

I believe we have been wrongfully taught that the peritoneum is a huge lymph sac perforated by numerous openings called stomata which directly connect with the lymphatic system and thus this great area for absorption. This view becomes of practical importance to us who are interested in the surgical pathology of infectious abdominal lesions, as most of the working factors of today's surgical teachings in the peritonitic abdomen have been founded upon this question of peritoneal absorption.

Histologic and physiologic studies have quite convinced laboratory investigators that the numerous stomata which are supposed to exist as the beginnings of lymphatic vessels do not in reality exist and further that the lymphatic vessels are not directly connected with the free surface of the peritoneum and in this sense are not the true absorbing vessels of the peritoneum.

This of course is flying in the face of what has been taught for the past fifteen or more years in regard to the treatment of the peritonitic abdomen. Not only has it been the teaching that the lymphatic vessels were the true absorbents of the abdominal cavity, but teachers have gone so far as to contend certain locations of the abdominal cavity were richer in these lymphatic absorbents than other regions. This teaching brought forth the Fowler position as it was contended that the lymphatics of the upper abdominal cavity were more numerous than in the lower, so the patient was placed in the Fowler position in order that infectious fluids would gravitate toward the pelvis where absorbing lymphatic vessels were not so numerous,

In a publication in 1910 we took the position that the final and fatal dose of toxins in the peritonitic abdomen did not come from the peritonitis per se, that a very little absorption took place from the peritonitic peritoneum and furthermore that lymphatic absorption had little to do with the final end of the peritonitic patient, that there was little if any difference between the upper and lower abdominal absorption, that we did not endorse the Fowler position not only on account of the above discussion but that the Fowler position did not give the most dependent point for drainage and that such position brought strain upon the heart and therefore we favored the right Sims position placing the patient in the attitude of flexion and rest in all drainage peritonitic conditions.

In regard to possible regions of maximum lymphatic absorption in the abdominal cavity, Dr. Hertzler in his most instructive work on the peritoneum says, "There is no more classical example of reasoning on false premises than that concerned with the supposed local site of maximum absorption from the peritoneum." Here are the words of a brilliant teacher of wide experience who has been an anatomist, a pathologist and a clinical teacher in surgery.

My work has not been in the laboratory, but my clinical experience made me endorse the teaching outlined in 1910, and I am grateful to those laboratory authorities who now permit me to stand by my guns.

It has been fairly well proved that the lymphatic vessels are not the true abdominal absorbents and that such absorption takes place through the blood vessels. If the lymphatic vessels were the true abdominal absorbents, why are the lymphatic glands not always involved in the acute peritonitic lesions? They are not. The lymphatic vessels are more apt to be involved in retroperitoneal conditions and in those more chronic lesions of the mucous membrane. This is quite in accord with the teaching that the lymphatic vessels do not have their beginning in the free surface of the peritoneum.

We take the position that the true function of the peritoneum is not offensive but defensive, and therefore its reactions to irritants is protective. Before we can discuss this view of the peritoneum we must place it within the abdomen as an organ with a true function, as have the liver and kidney. We have been too prone to think of the peritoneum as a great sheet or lining of the abdominal cavity and its contents and that about the only function it had was that of a suspensory ligament to the abdominal organs, whereas it is doubtful if the peritoneum has any suspensory function as a ligament.

Many interesting experiments have been made to show that the lymphatic vessels are not the true absorbents of abdominal fluids, for instance, examination of the peritoneal fluid shows no resemblance to contents of the lymphatic vessels. After the lymphatic vessels were tied, there was no diminution in rate of absorption of serum. Only

those factors which increase metabolism augment production of lymph; this only goes to show that the content of the lymphatic vessels is not a product of filtration but a cellular function. Substances placed within the abdominal cavity will appear in the urine before they are seen in the lymphatic vessels, showing that the true blood vessels are the real abdominal absorbents.

I have gone to some length into this function of the peritoneum in its relation to the lymphatic system because it has had much to do with the treatment of the infected peritoneum; indeed most of the working factors of today's teaching in the peritonitic abdomen have emanated from what we assume to be a false or mistaken idea of the function of the peritoneum and lymphatic system.

There is every reason to feel that the blood vessels and not the lymphatic vessels have most to do with the reactions of the peritoneum. The part played by the blood vessels in inflammation is well known, and it has been pointed out that the peritoneum has two sets of blood vessels, namely, service and potential. The service vessels are the conspicuous ones with which the student of anatomy is familiar; the potential vessels are those which come into immediate contact with the peritoneum and are only seen as active vessels when the peritoneum is irritated. We thus have an abundant blood supply to the peritoneum which seems to have an extra vascular system provided for emergencies, such as irritation or inflammation, and this again goes to indicate that the function of the peritoneum is defensive.

I have never endorsed the teaching that there were a number of openings leading from the abdominal cavity through the diaphragm; such communications were supposed to be responsible for infections conveyed from the abdominal cavity and the cause of collections of pus above the diaphragm. This reasoning has always seemed to me to be academic, and it is refreshing to find that investigations have shown that no such openings exist.

There is always a logical sequence to the behavior of infection, and when we are able to trace blood vessel and lymphatic connections, we find an anatomic road which has been the means of conveyance of infection. Our own ignorance is responsible for most of the supposed physiologic and anatomic defects in nature.

It is upon this question of peritoneal absorption of infection that the present day surgical teaching in peritonitis has been established, which has as some of its working factors the Fowler position, the source of the infection may or may not be removed, adhesions are not supposed to be broken under any circumstances, the active stage of the complicating peritonitis is not to be subjected to radical surgery, the patient is to be put upon the watchful waiting list for subsidence of active symptoms, during which time the Fowler position and saline solution by the bowel is the only treatment.

These working factors have been based upon antiperitoneal absorption and stand upon this one fragile leg of peritoneal absorption, even though so much has been done to show that the function of the peritoneum is defensive, and further, that the peritonitic peritoneum is not an absorbing membrane, for when exudate appears upon the peritoneum absorption ceases. We take the position that peritonitis is not forbidding but inviting, and were it not for the bowel obstruction, distal abscess and retroperitoneal absorption which accompanies the distended peritonitic abdomen, the peritonitis would more often win than lose the fight.

We assume the distended abdomen is not a symptom but a condition and invites active and immediate surgery in order to cope with the partial or complete bowel obstruction which is most often the cause of the final and fatal dose of toxins in the peritonitic patient and not the peritonitis per se.

The sacred adhesions of the present day teaching we contend are a part of the pathologic condition and must be dealt with in order to reach the bowel obstruction, distal abscess, etc.

We take the ground that the reactions of the peritoneum are defensive and therefore permit radical surgery, evisceration, etc., whereas the watchful waiting or physiologic surgeon assumes that the reactions of the peritoneum are offensive and permits no manipulation in the peritonitic state on account of fear of increasing peritoneal absorption.

We contend there is little if any absorption taking place from the already peritonitic peritoneum and that the peritonitic peritoneum will stand manipulation with less degree of shock than the normal peritoneum, never having seen a case of typical shock from a peritonitic patient. Distinction must here be made between operative depression and typical shock which comes on with suddenness and gravity some hours after operation.

Just as the peritonitic peritoneum has had the absorbents blocked, so has its sensitivity been dulled by the infection and is not as receptive as would be the normal peritoneum and therefore permits and welcomes radical surgery gently done.

That the reactions of the peritoneum are defensive or physiologic can be seen in the protective influence of the fluid which is very early thrown out in the acute lesions of the abdomen. This muddy fluid is probably sterile for some time and is sufficiently chemically irritant to produce a hyperemia of the peritoneum, this reaction being the earliest stage of peritoneal protection and the advance guard sent out against a threatened peritonitis. Such conditions when seen with a gangrenous appendix may be closed with brilliant results, and fewer untoward symptoms will follow than in removal of the ordinary clean appendix; the peritoneum had been prepared for the surgeon's hand, an evidence of reactive protection on the part of the peritoneum.

In considering the question of peritoneal absorption the chemical nature of the fluid must be taken into account. Inflammatory exudates with which we deal in the peritonitic abdomen are of an albuminous nature and therefore not as early absorbed by even a normal peritoneum as crystalline substances would be and little if at all absorbed by the peritonitic peritoneum.

We are not unmindful of the fact that overwhelming doses of toxins may be very rapidly taken up by the peritoneum before there is sufficient reaction on the part of the peritoneum to prevent absorption and prove fatal before a true peritonitis exists. This again argues for the defensive power of the peritonitic peritoneum.

During the surgical conduct of peritonitic lesions there are many evidences that the apparent severity of the peritonitis cannot be taken as a measure of the degree of infection; indeed the reverse is so.

In those cases where there has been evidence of a severe peritoneal reaction shown by the amount of exudate thrown out over an extensive area of peritoneum, we find the death-rate lower than where there has been little reaction of the peritoneum. These we call the dry cases, which simply means the type of infection is not a peritonitis, is a true retroperitoneal infection and is accompanied by a high mortality; this postulates that the peritoneum cannot be held culpable for all the intraabdominal toxemia.

The infection from the perforated retrocecal appendix is the most often fatal of all types of the perforated appendix, the patient often succumbing without evidence of a peritonitis and passes out with a flat abdomen and soluble bowel.

All forms of puerperal infections are accompanied by a very high mortality, and yet this condition cannot be classed as a true peritonitis but must be classed as a wound infection and involves the abdominal structures as a true retroperitoneal infection.

When infections extend to the abdominal viscera as retroperitoneal lesions and thus little influenced by the peritoneum, the mortality is high, which again bespeaks the protective influence of the peritoneum. We are trying to bring out the point that we are not justified in doing the incomplete work in the peritonitic abdomen, which is today's teaching, on account of fear of increasing peritoneal absorption when there are other more dangerous sources of toxemia; and especially is this so when there are numerous evidences to show that very little absorption takes place from the peritonitic peritoneum.

We make no contention that there is not a certain amount of absorption taking place in the peritoneum by way of the blood vessels, but we certainly question the right of the surgeon to ignore all other avenues of intoxication in the peritonitic abdomen in order that the peritonitic peritoneum must not be molested by surgical manipulation.

As we see it, the main point of contention between the operator who assumes that the function of the peritoneum is offensive as an absorbing membrane is that such teaching is only taking into account a superficial surface or the peritoneal lining of the abdominal cavity as a single source from which toxemia is to be combated; whereas, the operator who assumes that the reactions of the peritoneum are defensive takes the position that the peritonitic abdomen must be viewed with the idea of possible sources of infection throughout the continuity of the mass structure. In other words one operator has in mind surface topography, the other that the peritonitic peritoneum is a mountain of pathology which must be dealt with throughout the continuity of structure.

We take the view that it is not the peritonitis for which we operate but the complications of the peritonitis, namely, partial or complete bowel obstructions, proximal and distal abscesses, retroperitoneal infections, etc., the bowel obstructions probably being a cause of the final and fatal dose of toxins. This is the position we take in dealing with the peritonitic abdomen, this is our view of the surgical pathology of the peritonitic patient and can only be accomplished by breaking all adhesions and eviscerating all peritonitic structures as far as this may be possible; this is drainage, and it must be remembered that the very foundation in the treatment of the peritonitic abdomen is drainage. The incision into the abdomen is drainage, each adhesion broken is drainage, each infected structure removed is drainage, every partial or complete bowel obstruction released is double drainage, each abscess released is drainage, each structure released from a fixed dependent point and elevated is drainage, and the very foundation of drainage is removal of the distal infecting source.

All of these steps toward the accomplishment of proper drainage bring about release of intraabdominal tension which lessens intraabdominal absorption. So it must be seen that we cannot dismiss the great subject of drainage of the peritonitic abdomen by simply talking about a glass or rubber tube or a piece of gauze; nor can we dismiss the subject of drainage without taking into consideration the mucous membrane of the gastrointestinal canal, which after all is most to be considered in the distended abdomen; nor can we drain the peritonitic abdomen without release of the bowel obstruction and thus drain the mucous membrane of such infected canal.

It is our opinion such toilet cannot be done unless a proper cofferdam of gauze is used.

Tubal drainage is relatively worthless in these extensive lesions. It is the mechanical function of the properly inserted cofferdam of gauze which gives it its matchless life saving function.

This system of cofferdam drainage keeps the intestine elevated, which improves its circulation and prevents the bowel prolapsing into

the dependent and infected area, here to be reinfected and cause the postoperative bowel obstruction.

Irrespective of any actual amount of drainage the gauze may occasion, its mechanical function stamps it the superior means of drainage for combating these cases.

I had no intention of taking up even an incomplete discussion of the surgical pathology of this subject but have done so on account of the marked increase in death-rate during the past fifteen years in the peritonitic cases following the perforated appendix, which, I feel, is due to the incomplete toilet and the classification of the peritonitic patient into operative and nonoperative stages.

The failure to comprehend the true surgical pathology of the peritonitic peritoneum has brought forth those surgical steps which deal only with a superficial membrane, the peritoneum, as the cause of the fatal outcome of the peritonitic patient, when in reality it is only one of several sources of toxemia and probably the least cause of the fatal outcome of the peritonitic patient.

This subject is gone into at length in the monograph earlier referred to in this publication.

The present conduct of the peritonitic patient is challenged by the marked increase in death-rate for the past fifteen years.

In England and Wales the mortality in the acute appendicitis lesions has increased 7.3 per cent estimating on forty millions of people, in America 22.3 per cent estimating on eighty-seven millions of people, in Philadelphia 18 per cent.

Today's teaching in active peritonitis which has as factors incomplete surgery and watchful waiting for quiescence of acute symptoms, will always give a high death-rate, multiple operations on the same patient and postoperative complications so numerous as to condemn the primary procedure as unsurgical in every particular.

On account of the extraordinary rapidity with which repair takes place, the study of wound healing as seen on the peritoneal surface is one of the strongest arguments for the defensive function of this membrane; in a few minutes fibrin has formed and healing has begun.

This function of the peritoneum demonstrated by its ability to repair so rapidly its abraded surface and that function also shown by the celerity with which it surrounds foreign bodies that have been introduced into the abdominal cavity, should further teach us how very local and how very quickly local are all forms of drainage of the abdominal cavity.

When the profession teaches that the reactions of the peritoneum are defensive and not offensive, I feel then that the surgical pathology of peritonitis will be placed upon a true basis.

It is my opinion the history of the surgical pathology of peritonitis will have to be rewritten.

THE USE OF MERCUROCHROME AS A VAGINAL ANTISEPTIC BEFORE CESAREAN SECTION

REPORT OF 338 CASES AT THE METHODIST EPISCOPAL HOSPITAL*

BY HARRY W. MAYES, A.M., M.D., BROOKLYN, N. Y.

CESAREAN section, properly employed, has unquestionably saved the lives of many infants. Moreover, the higher morbidity and mortality attending this procedure are due in part to conditions for which the operation itself should not be blamed.

In a collective review of 1,805 cesarean sections performed in various hospitals of Brooklyn, Gordon¹ found the average maternal mortality to be 7 per cent. In 1,015 classical cesarean sections in which the records were complete, the mortality was 5.9 per cent; the deaths due to puerperal sepsis, 2.4 per cent. In 187 low cesarean sections, the total mortality was 4.2 per cent and that due to sepsis 2.4 per cent.

Reviewing a large series of cases from the British Isles, Holland² reported a maternal mortality of 7.5 per cent in 1,953 classical cesarean sections. The mortality due to infection alone was 4 per cent. In 1,142 low cesarean sections, the mortality was 4.1 per cent.

From the figures quoted in the two preceding paragraphs, it would appear that puerperal infection accounts for almost one-half of all the deaths following cesarean section.

Harris and Brown³ took cultures from fifty uteri at cesarean section and found twenty-two to be infected. All but one of the patients with infected uteri had fever during the puerperium. Also, in all of twenty-one patients in whom active labor had lasted six hours or over, the lower uterine segment was found infected.

Following the mercurochrome technic, I took uterine cultures in eleven cases at cesarean section, in none of which a pathogenic organism was grown. Seven cultures taken from the maternal surface of the part of the membranes corresponding to the cervix also proved negative.

The high incidence of infection in association with cesarean section suggested the use of mercurochrome as a vaginal antiseptic before the operation. If it were possible to destroy or inhibit the bacteria in the vagina at the onset of labor and prevent subsequent contamination arising from vaginal examinations and the use of instruments, the danger to the mother would be materially lessened and the obstetrician would have less hesitation in resorting to cesarean section, when indicated to save the life of the child.

Elsewhere I⁴ have shown that the use of mercurochrome in obstetrics compares favorably with iodine preparation and reduces maternal

*Read before the New York Obstetrical Society, November 12, 1928.

morbidity; that⁵ the use of a 4 per cent solution of mercurochrome as a vaginal antiseptic during labor and delivery reduces the morbidity from childbirth 50 per cent; that⁶ combined external preparation with mercurochrome and the use of this drug as a vaginal antiseptic effectively reduces puerperal morbidity; and that,⁷ when the hydrostatic bag is employed to induce labor, the use of mercurochrome may reduce the morbidity from 29 to 11.5 per cent.

During the last four years the mercurochrome technic was used in over six thousand deliveries at the Methodist Episcopal Hospital with a gratifying fall in the morbidity rates. During the last year the morbidity rate was only 40 per cent of what it was before mercurochrome was employed as a routine. And I am convinced that, were it not for

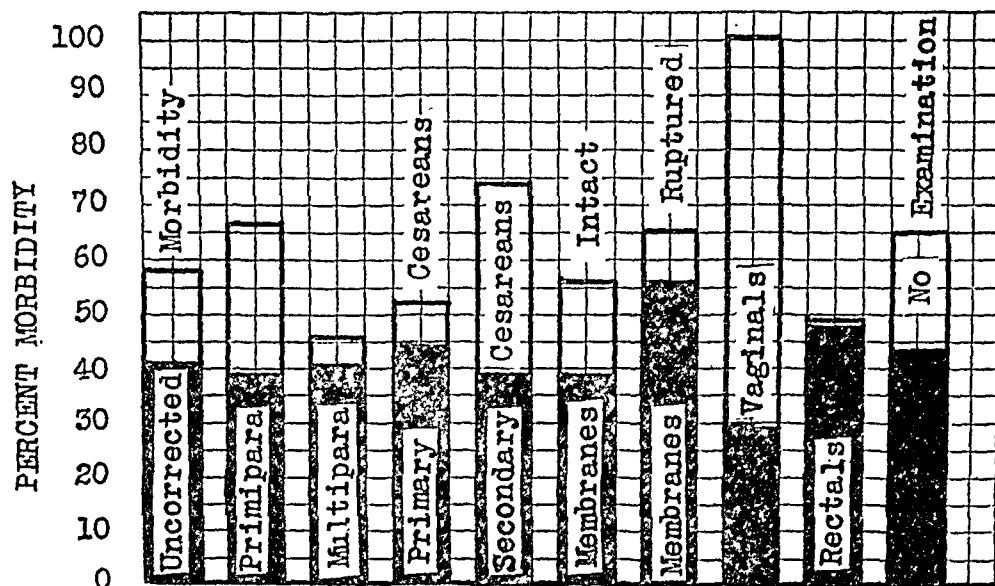


Fig. 1.—Chart showing a comparison of the morbidity with and without mercurochrome. The shaded area represents the mercurochrome series and the area outlined the morbidity without mercurochrome.

the routine use of mercurochrome during labor and at the time of delivery, our maternal morbidity now would be just as high as in previous years.

CESAREAN SECTIONS WITH AND WITHOUT MERCUROCHROME

Having in mind the value of mercurochrome in reducing maternal morbidity from infection both in normal labor and dystocia, I decided to compare results in two series of cesarean sections, in one of which mercurochrome preparation was employed as a routine and in the other of which it was not.

The series in which mercurochrome was employed as a vaginal antiseptic included 218 cesarean sections. Ninety-two, or 42.2 per cent, of these patients had a morbidity during the puerperium. The total number of days of morbidity was 541, representing an average of 2.5 days for each patient of the entire series.

One hundred twenty mothers were delivered by cesarean section without mercurochrome. Sixty-nine, or 57.5 per cent, of them had a morbidity during the puerperium. Their total number of days of morbidity was 456, or an average of 3.8 days for each patient of the entire series.

Apparently, the vaginal instillation of mercurochrome reduced the morbidity by 15.3 per cent and the average number of days for each patient by 1.3 days.

Analyzing the morbidity in the mercurochrome series, we find that puerperal morbidity was due in twenty-three cases to causes outside of delivery: respiratory complications, 10; breast complications, 2; phlebitis, 2; pyelitis, 2; toxemia, 2; colitis, 1; cystitis, 1; axillary abscess, 1; parotitis, 1; and appendicitis, 1. This gives a corrected morbidity of 31.7 per cent. The morbidity was accounted for by eleven cases in which the temperature curve suggested a reaction from the operation, nine cases of lochiometra, eight of wound infection, four of

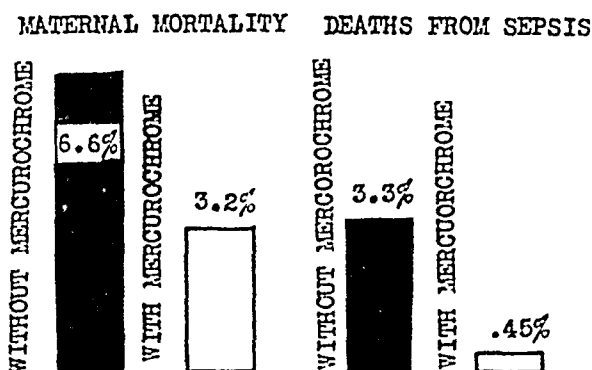


Fig. 2.—Chart showing a comparison of the maternal mortality and of the deaths from sepsis, with and without the mercurochrome technic.

endometritis, one of peritonitis, and thirty-six cases in which either the cause or the morbidity was not determined or no record was made on the clinical chart.

In eighty-three cases of disproportion with the use of mercurochrome, the morbidity was 45 per cent, as against a morbidity of 61 per cent in a corresponding series without mercurochrome. Also, in twenty-one cases of toxemia with the use of mercurochrome, the morbidity was 47 per cent, as against 64 per cent in twenty-five cases without mercurochrome.

COMPARATIVE MORTALITY STATISTICS

In the series with mercurochrome there were seven maternal deaths, a mortality of 3.2 per cent. In the series without mercurochrome there were eight maternal deaths, a mortality of 6.7 per cent. Also, one death (0.5 per cent) was due to infection in the series with mercurochrome, as against four deaths (3.3 per cent) in the series without mercurochrome.

The mortality rate was more than twice as high and the death rate due to sepsis almost seven times as high, when mercurochrome was not used as a vaginal antiseptic.

The patient who died from sepsis in spite of the use of mercurochrome was a primipara with unruptured membranes, who had been in labor a long time and passed into shock during the anesthesia. She bled profusely during the operation and later developed generalized peritonitis. As she took the anesthetic very poorly, I believe that she might have been saved if a local anesthetic had been used.

The remaining six deaths in the mercurochrome series were due to the following causes: acute cardiac dilatation, 2; pulmonary embolism, 2; cerebral hemorrhage, 1; and pneumonia, 1. These are conditions that may follow any operation regardless of the factor of infection.

In the series without mercurochrome four of the deaths were definitely due to puerperal sepsis. In two other fatal cases the mothers ran a high temperature and were probably infected, although death was ascribed to toxemia in one case and to acute cardiac dilatation in the other.

PRIMARY VERSUS SECONDARY CESAREAN SECTIONS

Without mercurochrome, there was a greater morbidity from secondary cesarean sections; while, with mercurochrome, the morbidity was greater from primary cesarean sections. In the series without mercurochrome, the morbidity was 52.7 per cent from primary and 74.1 per cent from secondary cesarean sections. In the series with mercurochrome, it was 44 per cent from primary and 39.3 per cent from secondary cesarean sections. The lower morbidity rate in the secondary cesarean cases may be accounted for by the fact that they have little or no labor.

PRIMIPARAE VERSUS MULTIPARAE

Without mercurochrome, the morbidity was 20.4 per cent greater in primiparae; while, with mercurochrome, the difference was only 2.7 per cent. These results compare favorably with those which I⁷ reported previously with reference to the morbidity following the induction of labor by means of the hydrostatic bag, according to which the morbidity without mercurochrome was almost twice as great in primiparae but almost the same in primiparae and multiparae when mercurochrome was used.

VAGINAL VERSUS RECTAL EXAMINATIONS

Ever since the memorable paper on the contagiousness of puerperal fever by Oliver Wendell Holmes in 1843, vaginal examinations have been blamed for the majority of infections following childbirth. To-day the consensus of opinion is that patients who have been examined by a midwife or physician prior to admission to a hospital may be considered as potentially infected.

Gordon¹ found that in 227 cases of classical cesarean section in which there had been vaginal examinations the mortality was 12.3 per cent, and in seventy cases in which there had been vaginal examinations before low cesarean sections it was 11.4 per cent. Compare these results with those of the mercurochrome series, in which fifty-four of the 218 patients, or 25 per cent, had vaginal examinations; yet the mortality was only 5.3 per cent.

In five cases in which vaginal examinations were made without mercurochrome preparation, there was a morbidity of 100 per cent and one death from sepsis. In seventy-one cases in which examinations were made by rectum instead of by the vagina, the morbidity was 49.3 per cent and there was one death from sepsis.

In fifty-four cases in which vaginal examinations were made with mercurochrome preparation there was a morbidity of 29.6 per cent and

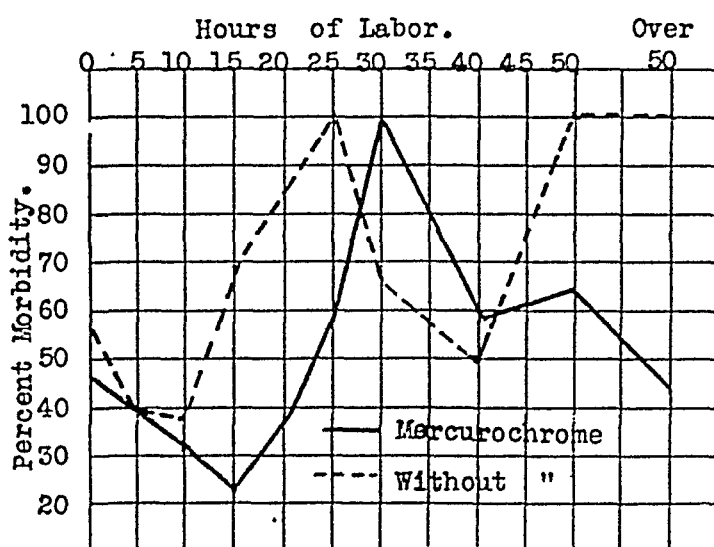


Fig. 3.—Effect of the duration of labor on the morbidity.*

one death from sepsis. In ninety-eight cases in which examinations were made by rectum instead of by the vagina, the morbidity was 48 per cent. When mercurochrome was used, more vaginal examinations were done and the morbidity was actually 18.4 per cent lower than when rectal examinations alone was employed. I believe that the lower morbidity in the group in which vaginal examinations were done was due to the fact that, when the examination was performed, mercurochrome was instilled again and brought by the manipulation into more intimate contact with the vaginal and cervical mucosa.

EFFECT OF RUPTURED MEMBRANES

Ruptured membranes caused a considerable increase in the morbidity in both series. When the membranes were intact, the morbidity

*Thirty-six of the patients in the mercurochrome series had a period of labor of over thirty hours with a morbidity of 64 per cent, while in the nonmercurochrome group there were only seven cases of labor over thirty hours and the morbidity was 85 per cent.

was 37.1 per cent with and 55.6 per cent without mercurochrome. When they were ruptured, it was 56 per cent with and 65.4 per cent without mercurochrome. Thus in the mercurochrome series the morbidity was 18.5 per cent lower when the membranes were intact and 9.4 per cent lower when they were ruptured than in the series without mercurochrome. Also, there were two deaths in the cases of ruptured membranes without mercurochrome and none in those with mercurochrome.

EFFECT OF DURATION OF LABOR ON MORBIDITY

Without mercurochrome there was a drop in the morbidity during the first five hours of labor below that in the cases with no labor. When labor was allowed to progress over ten hours, the morbidity rate rose rapidly, averaging 85 per cent for all patients in labor over fifteen hours.

With mercurochrome there was a steady fall in the morbidity below that in the cases with no labor until a period of fifteen hours was reached, after which there was a rise in the morbidity, which averaged 55.9 per cent for all patients in labor over fifteen hours.

In patients who had no labor the morbidity was 46.3 per cent with and 56.6 per cent without mercurochrome. There were no deaths from sepsis when mercurochrome was used but two septic deaths when mercurochrome was not used. The relatively high morbidity in the mercurochrome series without labor was probably due to the fact that the mercurochrome was improperly instilled or the operation followed the instillation too closely.

WOUND HEALING

The abdominal wound was infected in 12.5 per cent of the cases without mercurochrome, and these patients had a morbidity of 86 per cent. When mercurochrome was used, only 8.2 per cent of the wounds were infected and the morbidity was 65 per cent in these cases.

LOW CESAREAN SECTIONS

In the mercurochrome series there were twelve low cesarean sections, with a morbidity of 41.6 per cent and a mortality of 8.3 per cent. They were all primary. In six the membranes were ruptured, and in five vaginal examinations had been done. The average duration of labor for the twelve cases was thirty-three hours. One patient had had no labor.

Stein and Leventhal^b in 1928 reported forty laparotrachelotomies without a death in which they instilled 1 ounce of mercurochrome solution into the vagina before operation.

On the Second Obstetric Service, in charge of Dr. Ralph M. Beach, we have had eighty-six cesarean sections since the adoption of the mercurochrome technic as a routine at the Methodist Episcopal Hospital.

The morbidity was 37.7 per cent and there have been two deaths, a mortality of 2.3 per cent. All of these cesarean operations were of the classical type. In fact, we have never done a low cesarean section on the Second Obstetric Service.

When no effort is made to sterilize the birth canal before operation, there is no doubt that low cesarean section is of definite advantage; but, with the use of mercurochrome, the danger of infection is almost nil and there is no advantage in substituting a more difficult operation for the classic cesarean.

TECHNIC

Following careful perineal preparation, if the patient is in labor, the external genitalia and surrounding area are sprayed with a 4 per cent solution of mercurochrome and 3 drams of the same solution are instilled into the vagina by means of a special Asepto* syringe. The point of the syringe is blunt, so as to cause no injury, and the opening at the end is so small as to avoid leakage.

The tip of the syringe should be passed along the vaginal floor and the barrel held close to the pubes. When the syringe is inserted, the labia should be held close together to allow the fluid to enter the vagina under slight pressure. During labor, the instillation should be repeated every twelve hours and, if a cesarean section is contemplated, again one hour before the operation. In elective cesarean sections, when the patient is not in labor, I prefer to give two instillations one or more hours apart, preferably one on the night before and one on the morning of the operation.

In the preparation at the time of a vaginal delivery, the perineum is cleansed with a moist, sterile towel and the external genitalia and surrounding field sprayed with a 4 per cent acetone, alcohol, aqueous solution of mercurochrome. Then the pelvic floor is depressed and 2 drams of the mercurochrome solution are poured into the vagina. If the operation is prolonged, the field becomes soiled, or a laceration or an epistiotomy must be repaired, more mercurochrome should be used. If the patient has been in labor for some time and the mercurochrome technic has been used, I believe that she is not potentially infected even though she has had one or more vaginal examinations.

At the time of the cesarean section, the placenta should be left undisturbed until the uterus contracts down upon it. Contraction is hastened by the administration of 1 c.c. of pituitary extract immediately following delivery. After the placenta has been removed, 1 ounce of 4 per cent mercurochrome solution may be poured into the uterine cavity and allowed to drain through the cervix into the vagina. This procedure has been employed for almost all cases on the Second Obstetric Service, and I believe that it may help to destroy a certain number of bacteria which are left undisturbed by the vaginal instillation. I have observed no ill effects from this technic. When the fascia of the abdominal wound is closed, the wound is swabbed with mercurochrome, care being taken that no excess of the solution is left in the wound. Primary union invariably follows this procedure and the results seem to justify it.

We performed cesarean sections upon two patients following the use of the hydrostatic bag to induce labor. One patient had placenta previa, yet her morbidity lasted only two days. The other had a normal puerperium. In each case the child survived.

*Manufactured by Becton, Dickinson & Co., Rutherford, New Jersey.

One patient had had four vaginal examinations and the membranes had been ruptured for four hours. As an unsuccessful attempt had been made to deliver her by forceps, it was decided not to jeopardize further the life of the child. Accordingly, 2 ounces of a 1 per cent solution of mercurochrome were instilled into the uterus through a catheter passed above the presenting part and a classic cesarean section was performed one hour later. A living child was obtained and the mother had a normal puerperium. My procedure in this case was justified by the fact that bacteria are killed in one hour by a dilution of 1 to 1000 of mercurochrome in the liquor amnii.

On the basis of the cases just cited, the low morbidity rate following induction of labor, and the negative cultures obtained from the uterus at cesarean section, I believe that it might be better when other attempts at delivery prove the presence of disproportion or other abnormal conditions, to do a cesarean section rather than endanger or perhaps sacrifice the life of the child.

SUMMARY AND CONCLUSIONS

1. Two series of cesarean sections were performed at the Methodist Episcopal Hospital: one in which mercurochrome was employed as a vaginal antiseptic and the other in which this procedure was omitted. In 218 cesarean sections with mercurochrome, the morbidity was 42.2 per cent, averaging 2.5 days per patient. The mortality was 3.2 per cent and there was only one death from sepsis. In 120 cesarean sections without mercurochrome, the morbidity was 57.6 per cent, averaging 3.8 days per patient. The mortality was 6.7 per cent and there were four deaths from sepsis.

2. In the group with mercurochrome, five of the seven deaths were due to causes for which the operation itself could not be blamed. In the nonmercurochrome group, only two of the eight deaths were due to causes outside the operation.

3. With mercurochrome, the morbidity was 4.7 per cent greater from primary than from secondary cesarean sections. Without mercurochrome, it was 21.3 per cent greater from secondary sections.

4. The parity of the mother had very little effect on morbidity when mercurochrome was used. Without mercurochrome, the morbidity was 20.4 per cent greater in primiparae.

5. Without mercurochrome, the morbidity following vaginal examination was 100 per cent and there was one septic death. When mercurochrome was used, the morbidity was 18.4 per cent greater following rectal than after vaginal examination.

6. In the mercurochrome series, there were no deaths from infection in the forty-five cases with ruptured membranes. In the twenty-six cases without mercurochrome, there were two septic deaths.

7. Without mercurochrome, the morbidity rose rapidly when labor lasted over ten hours. When mercurochrome was used, the morbidity

did not begin to rise until labor lasted fifteen hours. When labor lasted over fifteen hours, the morbidity without mercurochrome was 85 per cent. With mercurochrome, it was 55.9 per cent.

8. When mercurochrome was used, the abdominal wound healed by primary union in all but 8.2 per cent of the cases. Without mercurochrome, 12.5 per cent of the wounds were infected.

9. I believe that the use of mercurochrome as a vaginal antiseptic during labor adds greatly to the mother's safety in the event of cesarean section.

10. When mercurochrome technic is employed, the patient is not potentially infected even though she has had a trial by labor, vaginal examination or an attempt at delivery by means of forceps or the hydrostatic bag.

11. When mercurochrome is used, low cervical cesarean section has little or no advantage over the classic operation.

REFERENCES

(1) *Gordon, C. A.*: AM. J. OBST. & GYNEC. 16: 307, 1928. (2) *Holland, E.*: J. Obst. & Gynec. Brit. Emp. 28: 358, 1921. (3) *Harris, J. W., and Brown, J. H.*: AM. J. OBST. & GYNEC. 13: 133, 1927. (4) *Mayes, H. W.*: AM. J. OBST. & GYNEC. 10: 161, 1925. (5) *Ibid.*: New York State J. Med. 26: 384, 1926. (6) *Ibid.*: Long Island M. J. 21: 146, 1927. (7) *Ibid.*: J. A. M. A. 89: 1685, 1927. (8) *Stein, I. F., and Leventhal, M. L.*: AM. J. OBST. & GYNEC. 16: 229, 1928.

494 FIRST STREET.

(For discussion, see page 723.)

NEUROLOGIC SYMPTOMS IN THE PREGNANT WOMAN*

By CHARLES W. BURR, M.D., PHILADELPHIA, PA.

PREGNANCY is a very upsetting thing because it interferes greatly with the usual chemical processes of the body, originates new reactions, and compels organs built to do certain things to take on new and temporary functions. One complicating thing is that nature uses makeshift apparatus. Comparison of the remains of extinct animals with living forms proves and illustrates this. Man evolved, he was not created. Nature, when making man, instead of creating a wholly new machine took an old one, our prehuman ancestor, added new things to it, modifications and improvements, and made the old do new work. The human body is like an old house which has had new parts added, has been modernized and improved, but in which much out-of-date furniture has been allowed to remain. The old machinery coupled with the new cannot work without friction.

All the nervous abnormalities that occur during pregnancy are seen in other conditions; all of them, however, except pregnancy itself are pathologic. Most often the disorders of pregnancy are due to pervers-

*Read at the meeting of the Philadelphia Obstetrical Society, March 1, 1928.

sion of chemical function, caused often by malfunction of those queer little organs we are only beginning to know something about, the ductless glands. First, let us consider the symptoms that are not severe enough to be called diseases. Very often the complaining woman is unjustly thought to be cranky, hysteric, or malingering; really she is ill. The symptoms I am speaking of are all sensory; they have their origin in the sensory side of the nervous system. Many women during pregnancy have supersensitive skins. They feel skin pain more acutely, though with the esthesiometer it could not be proved that they feel stimuli below the normal threshold. The pain sense is tremendously increased. It shows itself often in increased sensitiveness to heat. A woman begs to be put in a cold room, the ordinary temperature of the bedroom giving her a sense of painful heat throughout the body. In my early days when we exaggerated psychic influences, we explained such symptoms by saying, "Oh, she is a cranky woman," and did not seek any other explanation. We were wrong. This supersensitiveness is not hysterical, it has a physical basis; the sensory end organs react more strongly to stimuli than those of a person in ordinary condition, or the cerebral centers react too strongly to stimuli. Skin symptoms may go beyond sensory disorders; excessive sweating, even angioneurotic edema and other vasomotor disorders, occur. They are not psychic in origin, are not due to Freudian complexes; they have a real, physical, mechanical, and chemical basis. From similar causes women when pregnant have queer gustatory urges. They want to eat queer things. One group wants pickles and vinegar, another alkalies; another wants to chew chalk. We did not even credit them with mental disorders but blamed them for being cranky. Again we were wrong. It is not crankiness but chemical action which shows itself in consciousness by emotional irritability, which causes not only perversions of taste but also crankiness in conduct.

There is during pregnancy some alteration in the gastric and intestinal juices; and it is a natural but unconscious craving to get back to the normal physiologic chemical level that makes women eat or crave these things. Of course the poor woman does not know the reason, but she knows that she has a craving for something and when she gets it feels better. Vision too gives symptoms, usually not serious, but I would advise any doctor attending a pregnant woman who complains of her eyesight not to say, "Oh, they all do it," because occasionally, it may be once in five hundred times or once in fifty, but sooner or later, that dimness of vision, that bright light before the eyes, will have added to it occipital headache, a little vertigo, and then, if the doctor examines the urine, he will find the patient is on the verge of eclampsia. One of the most dangerous complications that can happen to women may reveal itself by complaints of poor vision that ninety-nine times out of a hundred is merely transitory, yet in that one hundredth case

is the precursory of an eclamptic convulsion. Smell also plays curious tricks and for the same reason. I remember a woman who was not insane, indeed she was very brilliant, who through two pregnancies got pleasure only, as far as smell was concerned, from feces; that was the only odor that gave her pleasure, and I am sure if she had been permitted to do so she would have smeared herself with ordure. With her it was not mental or moral smashup that made the change but some curious chemical change that perverted a real sense of smell. Neuralgias, of course, are very common but not evidences of serious illness. Toothache, trifacial and cardiac pain, pseudoangina, and uterine neuralgia are common. I recall a case occurring when I was a young man which frightened me greatly. Although the woman was only six months pregnant, she had, what I took to be, tremendous labor pains, referable to the womb. I sat up all night. I have never forgotten it, and it was a good lesson, but these false labor pains may certainly give not only pain to the poor suffering patient but also great distress to the young doctor who is trying to learn something of the peculiarities of pregnant women.

We come to the diseases complicating pregnancy. Probably the most important is St. Vitus' dance. Several of the textbooks on obstetrics (not on nervous diseases) say that if a child has chorea there is great danger of its recurrence during pregnancy. I do not like to differ with obstetricians, especially as I have not seen a woman in childbirth for more than a few years, but I must. St. Vitus' dance is the most frequent acute nervous disease of childhood. It is more frequent even than epilepsy. If the danger of a recurrence in pregnancy were very great, the number of cases of chorea would be very large; really it is small. I have had this experience. My colleagues and I have treated more than three thousand cases in children at the Infirmary for Nervous Diseases, and only a few have returned when pregnant. I ought to say our patients are from a stable population and would be likely to return, as they do for other diseases. I have treated thirty-two cases of chorea in mother and child, the mother having seen me in her girlhood and having brought her child years later. In none did the mother have St. Vitus' dance during pregnancy, neither in that of the child she brought to me nor in any pregnancy that she had had before, and in several cases there were two or three. That is one reason I believe the risk of maternity in the woman who in childhood had St. Vitus' dance is not very great. Certainly no one would advise a woman not to become a mother because in her childhood she had had St. Vitus' dance. The danger to herself is not great; the more important danger to the child, so far as heredity is concerned, is an increased susceptibility to rheumatism which may cause chorea. The factor of heredity is strong in rheumatism. I am talking of the true chorea of Sydenham, not of hysterical chorea and not of tic. A tic is an unwilling movement

that looks willed. A choreiform jerk is manifestly unwilled, sudden, jerky, violent, and in no degree simulates a willed movement. Hysterical chorea is always associated with other symptoms of hysteria. True chorea, in the pregnant woman, is much more serious than in children. Pregnancy rarely acts as more than a mere exciting cause of the attack. Though most often in St. Vitus' dance there is an underlying pathologic state that we call rheumatism, whatever it may be, yet several acute infectious fevers may start St. Vitus' dance, and probably some poisons that we know not of. Rarely there is no history of rheumatism or of any acute infectious fever and no endocarditis; there seem, therefore, to be a few women in whom the process of pregnancy is enough, so far as present-day knowledge goes, to cause this disease. The future will probably reveal a causative factor. Every person with St. Vitus' dance should be put to bed, and the pregnant woman quite as much as the young girl, and I say this, understanding and appreciating the importance of air and sun and moderate exercise and getting out-of-doors to keep the pregnant woman in good condition. But quiet, absolute physical rest is so vitally important in the cure of St. Vitus' dance that it is better to forego the good of outdoors and gentle exercise in order to give the woman complete muscular rest and also the mental rest that can only be gained in bed. No woman in the twentieth century can get mental rest out-of-doors. Few can get it save in the atmosphere of a well managed hospital. A modern home is rarely restful. Physical and mental rest are therapeutic necessities, and the only things that do real good in St. Vitus' dance, it does not matter what the particular cause in any given case may be. Now as to medicines, I have lived through many fashions in medicines. When I started out, we all gave Fowler's solution. Dr. Osler and Dr. Mitchell were my chiefs, and Dr. Mitchell ordered me to give all his patients three drops three times a day and increase to ten. Dr. Osler always said, "Dr. Burr, put this child to bed and keep its bowels open." Of course all were kept in bed, allowed few visitors, and properly fed. Now Osler's cure rate was exactly the same as Dr. Mitchell's in dealing with this particular disease. Today the fashionable drug is aspirin, and I am giving it faithfully, two and a half grains three times a day to all the little ones that come to my clinic, and of course in private you have to do something. I do not think that the aspirin does anything except make the family feel that the patient is getting some medicine. A written prescription is still a much worshipped, popular "godkin." Dr. Small's antirheumatic serum may prove to be very useful in cases occurring soon after an attack of acute inflammatory rheumatism. The treatment is too new to have proved its worth. If the muscle jerks are so great that something must be done or the patient will wear herself out, then you must give bromide or chloral or some other sedative to reduce excitement. There is no need for it unless the twitching is so

severe that the patient is wearing herself to death by muscular movement. Mildly to kick about does not hurt a woman or child. It does less harm than sedatives, but when the woman is bruising herself and her womb is being squeezed and pounded, you must give a sedative. Aspirin or Fowler's solution will not do any good. Of course, the great question in a severe case is, would abortion cure the mother? In the majority of cases it would not, because the chorea continues throughout pregnancy and does not cease until several weeks after the baby is born. In such cases therapeutic abortion would be useless. If, however, the mother is manifestly getting so exhausted that her life is in danger, it is justifiable and morally right to sacrifice the fetus if by so doing you can save the mother's life. But under no other conditions is it justifiable. Merely because a woman is somewhat sick, even quite severely ill, abortion is not permissible. What the maternal death rate in the chorea of pregnancy is, I do not know. It varies in the statistics of different writers. In my own experience it has occurred twice; I do not know how many cases I have seen altogether, probably thirty or forty, but the death rate of the mother has been very, very low. Recovery came during pregnancy in a few; in most, however, it came soon after natural birth. In a few cases, following my advice, the obstetrician brought on premature labor when the fetus was eight or eight and a half months old, a few weeks before the child would have been born naturally. That of course is permissible. It did good in most of my cases; in a few the chorea continued several weeks. Rarely it begins immediately or a few days after natural labor at term.

As to tetany I do not know the maternal death rate. I have only seen a few cases; all of them recovered, though the symptoms were so severe that the obstetricians wished my aid as a neurologic consultant. I have asked all my obstetric friends to tell me the maternal death rate, and they have all confessed they do not know. The statements of writers on the subject vary greatly. There is, however, a fetal death rate which some writers put quite high. The disease is rare in pregnant women, and the maternal death rate must be low. That of the fetus in some statistics has been 10 per cent. Symptomatically it is exactly like tetany occurring in rickety children, in diseases of the intestinal canal and in typhoid fever. Its cause is some disturbance of the functions of the parathyroid glands, brought about by the chemical disturbances of pregnancy.

Tetanus as a complication is historically interesting. Before its mycotic origin was known, English physicians practicing in India noticed that tetanus among pregnant women was much more frequent there than it was either in England or anywhere in the civilized world, and doctors being philosophically minded began to seek very remarkable causes and tried to prove that there was some curious racial factor in the East Indian woman that made her more susceptible to

lockjaw than was the rest of the world. When the real cause was discovered, the tetanus bacillus, the dirtiness of the women, dirt being a fruitful soil for pathogenic organisms, explained its frequency.

Epilepsy: No epileptic, man or woman, should have children. If the unborn have any right, it is the right to say, "In my stock there is no epileptic blood," because, if there is any disease that is carried down from generation to generation, it is epilepsy. There is no more terrible disease. However, epileptic women do become pregnant, and to make matters worse over the north Mediterranean coast there was and is a many centuries-old belief that pregnancy, if it does not cure epilepsy, at least prevents the fits during the carrying of the child, a most damnable, horrible belief, and one that has led to many a woman being impregnated when she should not have been. Of course, pregnancy will not in any way cure or even alleviate epilepsy. There is much discussion as to whether it can ever cause it. I do not believe it can. In the rare cases where apparently the first fit has occurred in pregnancy, the real explanation frequently is that the woman has had nocturnal fits unknown to her relatives over a long period of time. It is very much easier for me to believe that than to believe epilepsy could be caused by the physiologic process, pregnancy. It is quite common for epileptic fits to occur for years only during sleep. If the woman has some other disease coincident with the pregnancy, if, e.g., she is syphilitic, syphilitic meningitis may cause convulsions, but they are not epilepsy. There have been a few cases of the idiopathic disease reported. One, I remember, in my own experience was a forty year old woman who was alleged to have had her first convulsion during pregnancy and was still living at fifty. It is much easier for me to believe she had nocturnal epilepsy for years, even though I could not prove it, than that pregnancy caused it. The epileptic pregnant woman should be treated thoroughly, but be sure that you are treating epilepsy and not eclampsia. She may die if she does not have the proper eclamptic treatment.

The next disease is hysteria. It is the rarest and greatest disease in the world, and it is also the great scrap bag into which we throw every bizarre and queer thing when we do not want to confess ignorance or when we have gone mad on the psychic origin of disease. A pregnant woman will show hysteria provided hysteria is in her when she is born. You do not acquire hysteria, you are born with it. It is part of your very protoplasm; you do not get it because pregnant, or because your favorite son turns out to be a murderer, or your favorite sister a prostitute. Pregnancy in itself does not cause hysteria, but given the hysterical soil either of two things can happen, improvement or worsening, and that is one of the paradoxes of hysteria that it does not follow logic, but nothing in biology does. I have seen more than a few single women who were hysterical because they had an unconscious hunger

for a child. They did not realize the cause; it was not sex hunger but motherhood hunger, the same thing that the female lion, tiger, and dog have. I have seen several of these young women, foolish and hysterical before, turn into very healthy and good mothers when that unconscious hunger was satisfied. On the other hand pregnancy may make patent a latent hysteria. A woman may, under pregnancy, develop a few or many hysteric symptoms. Hysterical mutism and hemianesthesias are particularly interesting, and the former may be mistaken for a true aphasia caused by organic disease. The best treatment for hysteria is the rest cure; keep the patient away from loving relatives, never discuss symptoms with her, and give long bed rest, and later exercise. That is true both of the hysteria of pregnancy and hysteria from any other cause.

And now we come to two interesting diseases which pregnancy alleviates. One, Graves' disease, it occasionally cures. Certainly to look at a woman (and there are about eight women with Graves' disease to one man) with Graves' disease, if logic were of any account in this world, we would all say that those bulging eyes, the tense face, the manic manner, the tremor, the heart disorder, all mean "Don't become a mother," and yet, women with Graves' disease who become pregnant are almost never injured by their pregnancies, and very frequently all the symptoms pass into the background and sometimes cease permanently. Do not imagine I advise pregnancy as a cure for Graves' disease. It need not, however, alarm the doctor when he sees a pregnant woman with it. The other disease, relieved by pregnancy, is myasthenia gravis. It, however, returns after the child is born. The explanation of the temporary disappearance of symptoms is similar to that in exophthalmic goiter, namely, that there is something in the chemistry of the body during pregnancy that fills a deficiency, or remedies a perversion, which is the cause of exophthalmic goiter and myasthenia gravis. The ductless glands stand in some causal relation to both diseases.

None of the diseases I have been speaking about cause any gross organic cerebrospinal lesions. As to aphasia, hemiplegia, apoplexy, occurring in pregnancy, there is nothing that in and of itself should cause a rupture of a cerebral artery. If, however, the woman of child-bearing age has hardened arteries before the time she ought to, the plethora present may slightly increase the stress put on the blood vessels and thereby cause a rupture and a true apoplexy. If she has endocarditis, she may suffer from an embolus. Very rarely the pregnant woman will have a stroke with hemiplegia and aphasia and die, and on examination you will find no gross cerebral lesion. Always these cases are cardiorenal and vascular. The patients die of nephritis. Occasionally, and I can recall one case, very serious cerebral symptoms may be cured spontaneously. A woman during two successive preg-

nancies in the eighth month in each suddenly lost her speech and had a slight palsy of the right side of the face. She had no signs of cardio-renal or vascular disease. The aphasia which was real and not a mere hysteric mutism both times lasted between two and three months after a normal labor. I believe it was a toxemic attack, that her brain was locally poisoned, and that somehow it was tied up with the pregnancy itself.

There is no spinal cord disease that can be brought about by pregnancy alone, but once in a very great while you will see queer, aberrant spinal cord symptoms occurring which you cannot account for. A woman in the fourth month of her pregnancy, on getting out of bed one morning, realized she was awkward. She felt as she supposed one feels when drunk. Her legs would not do what she told them to. I found she had ataxia in both legs, also slight anesthesia and slight loss of motor power. Though her legs were somewhat weakened, the reflexes were normal, deep sensibility was retained, and bladder and rectal control was good. There was no pain and the nerve trunks were not sensitive to pressure. She was not syphilitic. It was her first child. I could not find any cause for her condition. She went on to term and, four or five months after the birth, recovered and for years has remained well. Some writers claim such cases are the result of a normal pregnancy and not due to some unknown complication.

One word as to so-called pressure palsies: Of course the head coming down is bound to press on the sacral plexus, the cords that go to make up the sciatic nerve, and there is bound to be pain, and there may be pressure palsy corresponding to that in a man who uses a crutch. Dr. Dereum years ago reported a case in which the gluteus maximus muscle was atrophied some weeks after the palsy came on. Such accidents are bound to happen but fortunately rarely and are purely mechanical. In addition to these true pressure palsies there is, I believe, a multiple neuritis involving both legs and not due directly to pressure on the cords that go to make up the nerves but to some intoxication. The palsy is almost entirely motor, like a lead neuritis, only first affecting the legs instead of the hands. I have seen the condition in childbirth and, I think, the explanation is an intoxication of the nerve trunks. My impression is, but I have no statistics to prove it, that pregnancy increases the likelihood of a painful, acute, alcoholic, multiple neuritis in women who drink.

1918 SPRUCE STREET.

(For discussion, see page 727.)

MODERN CONCEPTIONS OF RENAL DERANGEMENTS IN PREGNANCY*

BY G. KOLISCHER, M.D., CHICAGO, ILL.

THE modern conceptions of renal derangements in pregnancy are based on the application to this topic of our advanced general knowledge of the normal and pathologic physiology of renal function.

One fundamental point is that the kidneys act as an eliminatory terminal only.

The intermediate structures interposed between alimentary tract and kidneys act under normal conditions as temporary deposits of the somatic waste products and consequently also play an important rôle in the urinary excretion. Biologists acknowledge their dignity by applying to them the term adventitious kidney.

Under pathologic conditions a lesser or larger amount of these metabolic slags is retained for an extended time within these intermediate structures.

Any renal disturbance has to be considered as a local manifestation of a general derangement and not as an independent idiopathic disease.

In pregnancy primarily two eliminatory disturbances come under consideration, the nephritic and the nephrotic condition. The former is based on a capillary toxicosis and manifests itself within the kidney mainly as glomerulitis, the latter is accompanied by degeneration of the tubular epithelia.

Functionally nephritis is characterized by the retention of organic waste products, nephrosis by the retention of chlorides.

Retention of the organic slags may occasionally occur in the intermediate structures only, so that in such instances the NPN and creatinine contents of the blood show normal figures because the surplus of the organic slags never reaches the blood. The indicator for this form of retention is the appearance of pronounced indicanemia. Incidentally it may be mentioned that in grave gestation toxicosis, urobilin and bilirubin are found in the blood.

The appearance of edema or hydrops gravidarum may be explained in two ways. It is known that toxic capillaritis produces an extreme permeability of the capillary walls. Therefore the nephritic edema may be considered a toxic transudation, while the edema in nephrosis is an osmotic phenomenon due to the attraction of water by the accumulated chlorides within the intermediate structures.

Nephrotic disturbances are more common in pregnancy than the nephritic ones.

*Read at the meeting of the Chicago Gynecological Society, June 22, 1925.

Nephrosis is prognostically more favorable than nephritis; it is for instance never accompanied by a true retinitis which will occur in a certain percentage of nephritic cases.

Nephrosis practically never forms an indication for interruption of pregnancy; severe nephritis with its concomitant side issues is one of the most urgent factors in deciding upon the forced emptying of the uterus.

All these considerations make it evident that the traditional routine examination in the prenatal clinic is insufficient. It has to be supplemented by systematic and complete examination of the blood, by regular examination of the ocular background, by estimating the daily output of chlorides and by testing the functional flexibility of the kidneys.

The connection of renal disturbances and eclampsia may be twofold.

Either the additional metabolic slags originating in embryo and placenta are not sufficiently disintegrated in the pertinent organs and then produce pathologic changes in the eliminatory system, or an already existing nephritis reduces the proper elimination of all the organic waste products, leading to pseudouremia.

That the end products of the intrauterine metabolism have a specific influence on the kidney different from that exerted by bacterial toxins is made probable by the fact that the latter produce capillaritis and glomerulitis while the toxins of intrauterine origin produce renal arteritis, as proved by postmortem examination after eclamptic death.

It may also be mentioned that in the preeclamptic and eclamptic stages pronounced functional disturbances are to be observed in the ocular arteries. The discovery that in a certain category of cells comprised as the reticuloendothelial system reside the defensive forces of the body threw considerable light on the eliminatory disturbances in pregnancy. Among other functions these cells have the capacity of storing and disintegrating toxins of extraneous and indigenous origin.

It is also known that the efficiency of these cells may be stimulated by the aseptic protein shock.

It was observed that in a good many pregnant women, especially during the latter half of gestation, the efficiency of the reticuloendothelial system is impaired.

It is easily understood that this fact together with the increased metabolism of pregnancy places the eliminatory system under a double disadvantage, excess of waste products and weakening of the defensive forces.

That explains for instance the fact that under this handicap previously existing slight abnormalities may develop into severe and lasting involvements of the upper urinary tract, as demonstrated by Danforth and Corbus.

It also emphasizes the importance of cystoscopic and roentgenologic examination if pus appears in the urine of a pregnant woman.

Methods have been developed to estimate in the living subject the efficiency, respectively deficiency, of the reticuloendothelial system.

It seems that proper consideration of the reticuloendothelial system furnishes another link for our diagnostic, prognostic and therapeutic reasoning.

It may be suggested that the testing of this system may be accepted as an integral part of the examination of pregnant women, at least in all instances in which renal disturbances become evident.

It may also be considered that if in spite of our therapeutic efforts the efficiency of the reticuloendothelial system does not rise or even deteriorates, this symptom may round out the indication for emptying the uterus, although the additional syndrome does not yet furnish a cogent indication.

At any rate the discovery of a weakening of this system calls for the administration of the protein shock together with all the other anti-nephritic measures and excludes waiting until the toxins have invaded, inundated and overwhelmed all the eliminatory cells.

(For discussion, see page 730.)

A SURVEY OF CESAREAN SECTION AT THE METHODIST EPISCOPAL MATERNITY*

By O. PAUL HUMPSTONE, M.D., BROOKLYN, N. Y.

THE present widespread effort to report the incidence of cesarean section in different hospitals of the United States is the best example of the American principle of mass study of efficiency which has yet been applied to medical science. It will function to harmonize, revise, or justify divergent judgments as to the use of cesarean section.

A committee of the Brooklyn Gynecological Society has published such a study for our Borough.† I desire to enter into a somewhat more minute survey of the cases in our own institution and to draw a few deductions from our records and experiences.

TABLE I. CESAREANS AT THE METHODIST EPISCOPAL MATERNITY

	TOTAL CASES	TOTAL CESAREANS	DEATHS	MORBIDITY	CESAREAN RATIO
1920	800	35	3 or 8.5%	13 or 37.0%	1 in 23.0 or 4.3%
1921	838	46	2 or 4.3%	16 or 34.7%	1 in 18.2 or 5.4%
1922	790	43	1 or 2.3%	13 or 30.0%	1 in 18.3 or 5.4%
1923	938	62	2 or 3.2%	28 or 45.0%	1 in 15.1 or 6.6%
1924	1258	63	5 or 7.8 %	22 or 34.7%	1 in 19.9 or 5.0%
1925	1535	51	2 or 3.9%	22 or 43.1%	1 in 30.0 or 3.3%
1926	1799	59	0	14 or 23.7%	1 in 30.4 or 3.2%
Total	7958	359	15 or 4.3%	128 or 35.6%	1 in 22.1 or 4.5%

*Read at a meeting of the Brooklyn Gynecological Society, December 2, 1927, and at the New York State Sectional Meeting of the American College of Surgeons.

†See this Journal, 16: 507, September, 1928.

We have arbitrarily taken the case histories of the last seven years, since many of the earlier charts are too incomplete to be really useful as premises for deduction. We have arranged our study in tabulated form and appended to each table a few comments.

COMMENT

The incidence of 1 in 22 or 4.5 per cent for the series, shows a marked diminution in the last two years of 1 in 30 or 3+ per cent. This may be definitely laid to several factors: A radical change of view on the use of cesarean section in the treatment of preeclamptic toxemia and eclampsia, and secondly to better antepartum care, study of contracted pelvis with test of labor in all cases not absolutely contracted, and consultation before a primary cesarean section.

We believe this incidence to be nearly correct for an obstetric institution handling the class and types of patients such as we have, and applying the indications for cesarean section as we do.

Mortality and morbidity.—The mortality is analyzed in a later chart. Morbidity was present in 35 per cent of the cases, being judged on an observation of a temperature of 100.4° for two consecutive days, excepting the twenty-four hours after delivery. The records show an average stay in the hospital of between four and five days beyond the normal case.

We believe the morbidity definitely was diminished by the use of 4 per cent mercurochrome as a vaginal preparation before cesarean section. In the year 1926, when this was done for the first time in every case, the morbidity was lowered from the average 35 per cent to less than 24 per cent and not a mother was lost.

* * * *

TABLE II. INCIDENCE IN WARD AND PRIVATE PATIENTS

Deliveries—1925		Cesareans—1925		Cesarean Ratio	
Private	Ward	Private	Ward	Private	Ward
868	667	46	6	1 in 21+ or 4.7%	1 in 111 or 0.9 %
Deliveries—1926		Cesareans—1926			
Private	Ward	Private	Ward	Private	Ward
1039	760	54	5	1 in 19 or 5.2%	1 in 152 or 0.75%

COMMENT

In most hospital reports of cesarean section, it is the ward service only which is reported. Our hospital is composed of one-third private patients, one-third semiprivate and private wards, and one-third ward beds. The number of private patients is therefore greater than ward and the incidence of cesarean section is greater in private patients because of several factors, chief of which is that the private work of the heads of service is composed in a large part of cases which come to them as expert obstetricians because of previous difficult labors with the loss of the baby, of previous cesarean section. I have at the present time seven cases of previous cesarean section under observation, not one of which was done in our institution. Furthermore, cases

come diagnosticated as contracted pelvis or other complications of pregnancy which may demand cesarean section. The responsibility placed on us to obtain a live baby demands that we take as little chance of the loss of the baby in birth as is compatible with good obstetric judgment.

* * * *

TABLE III. ANALYSIS OF MATERNAL DEATHS; 15, OR 4.3 PER CENT

INDICATION FOR CESAREAN		ACUTE CARDIAC DILATATION	INFECTION	CEREBRAL HEMOR- RHAGE	POSTOPER. SHOCK
Contracted pelvis	5 or 2.7%	2	2	0	1
Toxemia and eclampsia	7 or 17.5%	0	5	1	1
Antepartum hemorrhage	0	0	0	0	0
Other indications	3 or 2.4%	0	3	0	0

COMMENT

The mortality of 4.3 per cent is greater than the general mortality of the department for these years (0.73 per cent). Nearly 50 per cent of the mortality is in the eclampsia and toxemia cases; the mortality in all other indications being under 3 per cent. The test of labor, particularly with ruptured membranes adds to the mortality from sepsis and cardiac complications in contracted pelvis. The striking absence of mortality in the antepartum hemorrhage cases is referred to in a later table.

* * * *

TABLE IV. ANALYSIS OF FETAL DEATHS; 22 OR 6.1 PER CENT

INDICATION FOR CESAREAN		
Premature, 18	Preeclamptic toxemia	8
	Eclampsia	2
	Ablatio placentae	1
	Accidental hemorrhage with toxemia	1
	Accidental hemorrhage without toxemia	2
	Acute gangrenous appendicitis	1
	Rupture of cesarean scar	1
	Cardiac decompensation	1
	Chorea	1
Term, 4	Monsters	2
	Impacted shoulder	1
	Blocking of pelvis by fibroid tumor	1

COMMENT

Fetal mortality of 6.1 per cent, included 18 prematures, 12 of which were in the eclamptic group of indications, 6 where the cesarean section indication was strictly in the mother's interest. Four full-term babies included 2 monsters. These occurred before the use of the x-ray examination as a routine before cesarean section, which will generally eliminate such a mistake. The impacted shoulder was in a uterus tonically contracted so as to be unsafe for any attempt at delivery below, potentially infected and in which a hysterectomy was done. Likewise the fibroid case, the baby dead on admission, impossible of delivery from below, a cervical fibroid completely blocking the pelvis. A hysterectomy was done. Not one normal baby was lost in the series.

* * * *

TABLE V. INDICATIONS

	TOTAL CESAREANS	CONTRACTED PELVIS	ECLAMPSIA AND PREECLAMPTIC TOXEMIA	ANTEPARTUM HEMORRHAGE	OTHER INDICATIONS
1920	35	19	2	1	13
1921	46	26	4	0	16
1922	43	20	2	1	20
1923	62	29	9	3	21
1924	63	26	13	6	18
1925	51	28	2	3	18
1926	59	33	8	1	17
Total	359	181	40	15	123

COMMENT

This table shows the general indications employed in the series. The 123 other indications will be analyzed more carefully later on. It should be noted that the various indications do not differ very materially in the different years in proportionate employment except the pre-eclamptic toxemias in 1924.

* * * *

TABLE VI. CONTRACTED PELVIS

TYPE		FETAL DEATHS	MATERNAL DEATHS
Not given (early records incomplete)	46	0	1
Funnel	35	1	1
Flat	22	0	0
Generally contracted	56	0	0
Rachitic	9	1	3
High assimilation	12	0	0
Tubercular hip	1	0	0

COMMENT

Just criticism may be made of the first item. Such inaccurate records at the present time would not pass our monthly study of all contracted pelvises in the staff meetings. Only 32 of the series had an absolute indication of less than $7\frac{1}{2}$ cm. true conjugate. The rest all had a test of labor of from six to fifty-four hours except the tubercular hip case which was in the acute stage with open sinuses, and in such a poor general condition that no labor was deemed wise.

* * * *

TABLE VII. ECLAMPSIA AND PREECLAMPTIC TOXEMIA

YEAR	TOTAL ECLAMPSIA	DEATHS	TOTAL PREECLAMPTIC	DEATHS
1920	3	1	9	1
1921	3	0	8	0
1922	5	1	10	1
1923	5	1	8	1
1924	9	0	5	1
1925	3	1	4	1
1926	12	2	5	0
Total	40	6, 14+%	49	5, 10+%

Treated by Cesarean
 Toxemia of Pregnancy 34—5 Deaths 14 + %
 Eclampsia 6—2 Deaths 33 $\frac{1}{2}$ %

COMMENT

This table shows all the eclamptics and preeclamptic toxemias treated in the years studied, and below, those of this series which were treated by cesarean section, 40 cases out of 89. While the mortality of the whole series of eclamptics was 14 per cent, that of the six cases treated with cesarean section was 33 $\frac{1}{3}$ per cent showing the now well-known fact that when a patient has gone on to convulsions, she has ceased to be a suitable case for surgery except in absolute contraction of the pelvis, and the occasional primipara in the ninth month with live baby and long undilated cervix, who will not respond to treatment.

Of the preeclamptics, 34 out of 49 were treated with cesarean section with a slightly increased mortality over the series 14 per cent instead of 10 per cent for the whole series. We now feel that in a primiparous woman with no labor and a viable baby and increasing severity of symptoms notwithstanding treatment, we find our only indication for the use of cesarean in preeclamptic toxemia.

* * * *

TABLE VIII. ANTEPARTUM HEMORRHAGE

TYPE		FETAL DEATHS	MATERNAL DEATHS
Accidental hemorrhage with toxemia	3	2	0
Accidental hemorrhage without toxemia	2	2	0
Placenta previa	10	0	0

COMMENT

This table shows the employment of cesarean section in antepartum hemorrhage, with no maternal deaths in the series and no fetal deaths in the placenta previas. We now believe that all central placenta previas after viability of the child should be treated by classical cesarean section on the theory that the lower zone of the uterus is to be protected from stretching and traumatism as much as possible, thus assuring its contraction and retraction to avoid the postpartum bleeding which is the fatal factor in these cases.

* * * *

TABLE IX. OTHER INDICATIONS

TYPE		FETAL DEATHS	MATERNAL DEATHS
Fetal dystocia	15	0	1
Cervical dystocia	19	0	1
Postoperative dystocia	10	0	1
Tumors in pelvis Fibroid	9	1	0
Ovarian cysts	2	0	0
Abnormal presentations	2	1	0
Cardiac condition	3	1	0
Pulmonary condition	2	0	0
Systemic disease	1	0	0
Intestinal obstruction	1	0	0
Appendicitis, acute gangrenous	1	1	0
Pendulous abdomen	2	0	0
Previous cesarean (no other indication given)	43	1	0
Uterine inertia	7	0	0
Psychosis	1	0	0
Uterine and vaginal congenital malformations	4	0	0

COMMENT

This table shows other indications than those already enumerated, 123 cases out of a total of 359.

Fetal Dystocia. After a test of labor, all the babies weighing over 9 pounds with no engagement and retraction of the lower zone.

Cervical Dystocia. After long test of labor, with not over 2½ fingers dilatation, thick firm edematous cervixes and contraction ring development, and head still just dipping into the brim. I know of no more difficult complication to successful delivery than this situation.

Postoperative Dystocia. Previous ventral fixation. Previous ligament operations with complete plastic pelvic repair particularly amputaion of the cervix. Previous interposition operations with amputation of the cervix and failure to sterilize.

Tumors blocking the pelvis, not reducible and making delivery by the natural passages impossible.

Abnormal Presentation. Irreducible chin posterior in a primipara and the impacted shoulder case noted before with tonic uterus threatening rupture.

Cardiac Conditions. Chorea gravidarum and two cases of decompensated mitral stenosis. All sterilized.

Pulmonary Conditions. Two cases of active tuberculosis in primiparae with sterilization.

Systemic Disease. A case of marked asthenia from prolonged pyelitis and great desire for a child.

Intestinal Obstruction. From a band complicating the last month of pregnancy, impossible to be dealt with until the uterus had been emptied.

Acute Gangrenous Appendicitis in the eighth month of pregnancy. Case reported in full by Dr. Robert Wilson in *Surgery Gynecology and Obstetrics*.

Pendulous Abdomen. Two cases of threatened colporexis which could not be controlled by binders.

Previous cesarean done elsewhere and wherein the reason for the previous cesarean could not be determined and the condition of the scar did not warrant labor.

Uterine Inertia. Primary uterine inertia with ruptured membranes and questionable proportion of baby to pelvis.

Psychosis. An acute case in which the same condition had appeared in a previous pregnancy, with sterilization after consultation with psychiatrist.

Uterine and Vaginal Malformations. Two cases of double vagina with failure to dilate. One case of pregnancy in a rudimentary horn of the uterus, one case of uterus didelphys with failure to dilate and engage.

* * *

TABLE X. ANALYSIS OF CASES WHERE HYSTERECTOMY OR STERILIZATION WAS DONE

INDICATIONS	STERILIZED DURING FIRST CESAREAN	STERILIZED DURING SUBSEQUENT CESAREAN	HYSTERECTOMY
Toxemia	3	4	0
Eclampsia	0	1	0
Contracted pelvis	1	16	3 All infected on admission
Antepartum hemorrhage	0	0	0
Fibroid uterus	1	0	2
Chorea gravidarum	1	0	0
Previous cesarean (other indication not given)	0	10	1
Uterine inertia	0	0	1 Potentially infected
Abnormal presentation	0	0	1
Cervical dystocia	1	0	0
Dystocia due to previous operation	1	0	0
Psychosis	1	0	0
Pulmonary tuberculosis	2	0	0

COMMENT

Hysterectomy we believe is seldom called for when cesarean is done. Large fibroids which cannot easily be enucleated and cases which are frankly infected, are best dealt with by this treatment. Sterilization is done by double silk ligature of each tube and division of the tube between the ligature and burial of the uterine end by a purse-string suture of catgut. Sterilization is offered to a woman who should not have more children; and we deem a patient who has had three cesarean sections such a woman. The truth of this dogmatic statement is yet to be fully determined.

The conclusions from this study are included in the comments on each chart and do not need reiteration. The operations were all classical cesarean sections.

327 WASHINGTON AVENUE.

PROCIDENTIA

A STUDY OF 683 CASES TREATED BETWEEN 1875 AND 1928 AT THE FREE HOSPITAL FOR WOMEN, BROOKLINE, MASSACHUSETTS

BY GEORGE VAN S. SMITH, M.D., WILLIAM P. GRAVES, M.D., AND
FRANK A. PEMBLERTON, M.D., BOSTON, MASS.

PROCIDENTIA is here considered as an advanced degree of uterine prolapse in which the cervix, or even the whole uterus, protrudes through the introitus and appears outside the vulva. The condition is accompanied by a variable amount of vaginal relaxation of the anterior and posterior walls, as a cystocele and rectocele. In the great majority of cases the trauma of childbirth is the chief predisposing cause. Other factors include improper care during the puerperium, physical exertion (occupation, coughing, sudden strains, etc.), lack of timely preventive surgical repair, marked atrophy of the pelvic organs, structural abnormality of the bony pelvis, and finally a general qualitative deficiency in the tone and elasticity of the pelvic tissues.

AGE TABLES

A protrusion or "falling of the womb" was first noticed between the ages of

15 and 20 by	3 patients
20 and 25 by	27 patients
25 and 30 by	57 patients
30 and 35 by	87 patients
35 and 40 by	121 patients
40 and 45 by	115 patients
45 and 50 by	83 patients
50 and 55 by	66 patients
55 and 60 by	43 patients
60 and 65 by	31 patients
65 and 70 by	8 patients
70 and 75 by	4 patients
75 and 80 by	1 patient
Indefinite—	37 patients

The number of patients seen or treated between the ages of

15 and 20 was	1
20 and 25 were	3
25 and 30 were	17
30 and 35 were	55
35 and 40 were	93
40 and 45 were	131
45 and 50 were	104
50 and 55 were	101
55 and 60 were	68
60 and 65 were	64
65 and 70 were	33
70 and 75 were	12
80 and 85 was	1

Between 1875 and 1928 a diagnosis of procidentia was made on 683 cases seen at this clinic, exclusive of many cases in the out-patient department that were not subjected to operative treatment.

The youngest patient at the time of treatment was fifteen years of age, the oldest eighty-three.

FAMILY HISTORY

Tuberculosis	52	7.6 per cent
"Cancer"	46	6.7 per cent

PREVIOUS SURGICAL HISTORY

Dilatation and curettage	28	Hemorrhoidectomy	9
Hysterectomy	7	Fistula in ano	2
Operation on adnexa	12	Gall bladder operation	3
Bartholin's abscess	2	Appendectomy	25
Vaginal repair operation (not for procidentia)	68		
Operation for suspension of uterus	23		
Repair operation for procidentia	18		
Inguinal hernia repaired	3		
Umbilical hernia repaired	1		
Postoperative hernia repaired	3		

MARITAL HISTORY

Nineteen patients, 2.78 per cent, were unmarried and gave no history of pregnancy. Seven married patients had never been pregnant, a sterility percentage of only 1.05. If the six patients who had had abortions or miscarriages but no children be included with those who were never pregnant the percentage of infertility becomes only 1.95, a very low figure compared with the average sterility percentage of 10 to 16 among married women in general.

MENSTRUAL HISTORY

One hundred and eighty-seven patients had passed the menopause when symptoms of procidentia began, 27.3 per cent. Of the other 496 patients 104, or 20.9 per cent, had some menstrual abnormality, chiefly in the form of mild dysmenorrhea or some irregularity in catamenia, or both. In no instance was abnormal menstruation a major complaint.

OBSTETRIC HISTORY

At the time when patients were first seen or treated

102 had had 1 child	21 had had 9 children
120 " " 2 children	10 " " 10 "
112 " " 3 "	10 " " 11 "
106 " " 4 "	2 " " 12 "
59 " " 5 "	1 " " 13 "
42 " " 6 "	1 " " 14 "
35 " " 7 "	1 " " 15 "
28 " " 8 "	1 " " 20 "

Four patients had given birth to twins, 0.6 per cent. The average number of children per married patient was 3.92.

In 128 instances it was not mentioned in the records whether the labors had been normal or instrumental. Of the remaining 523 patients

237, or 45.3 per cent, stated that they had had normal labors, and 286, or 54.7 per cent, stated that they had had one or more instrumental deliveries. They are tabulated as follows:

1 instrumental delivery	167	5 instrumental deliveries	9
2 " deliveries	57	6 " "	8
3 " "	23	8 " "	1
4 " "	19	9 " "	2

Seven patients, 1.07 per cent, of the 651 who had children were reported as having had one breech delivery.

The following table shows how many labors patients had before symptoms of procidentia were noticed. It is not intended to indicate any time relation, however, for the interval between the last labor and the onset of procidentia varied from less than one month to forty-five years.

Before onset of symptoms	152	patients had had	1 labor
" " " "	108	" " "	2 labors
" " " "	104	" " "	3 "
" " " "	83	" " "	4 "
" " " "	55	" " "	5 "
" " " "	35	" " "	6 "
" " " "	29	" " "	7 "
" " " "	22	" " "	8 "
" " " "	18	" " "	9 "
" " " "	9	" " "	10 "
" " " "	6	" " "	11 "
" " " "	2	" " "	12 "
" " " "	1	" " "	13 "
" " " "	1	" " "	14 "
" " " "	1	" " "	15 "
" " " "	1	" " "	20 "
" " " "	1	" " "	1 miscarriage
" " " "	3	" " "	twins
Insufficient data	20		

INTERVAL BETWEEN LAST LABOR AND ONSET OF PROCIDENTIA

In 175 cases symptoms began	1 year or less after preceding labor
" 70 " " " "	1 to 2 years " " "
" 40 " " " "	2 " 3 " " "
" 18 " " " "	3 " 4 " " "
" 12 " " " "	4 " 5 " " "
" 20 " " " "	5 " 6 " " "
" 18 " " " "	6 " 7 " " "
" 13 " " " "	7 " 8 " " "
" 19 " " " "	8 " 9 " " "
" 67 " " " "	10 " 15 " " "
" 47 " " " "	15 " 20 " " "
" 42 " " " "	20 " 25 " " "
" 28 " " " "	25 " 30 " " "
" 24 " " " "	30 " 45 " " "
Unrecorded—58	

Thus in 48 per cent of patients symptoms began one month to three years after the preceding labor; in 16.6 per cent they began three to ten years later; and in 35 per cent they began from ten to forty-five years afterward.

SYMPTOMS

683	patients	complained	of	protrusion or "falling of the womb"
118	"	"	"	backache
214	"	"	"	urinary incontinence
77	"	"	"	urinary frequency
16	"	"	"	difficult micturition
14	"	"	"	burning micturition
9	"	"	"	fecal incontinence
49	"	"	"	bearing down in pelvis
6	"	"	"	pain in lower abdomen
5	"	"	"	swelling of abdomen

The patients who complained of abdominal swelling were found to have large tumors, one of which was an ovarian cyst weighing 64 pounds. Another symptom very common but rarely recorded, is fatigue. Most of the patients with procidentia suffered from fatigue though the symptom was not systematically recorded in the histories of this series. Numerous factors contribute to this sense of tire, among them being the discomfort of the protruding mass, the mental drain of having the attention constantly fixed on a genital abnormality, the fear of cancer, the drag and pressure from lack of pelvic support, and the backache and pain in the loins that result from the abdominal relaxation that usually accompanies procidentia. From a constitutional standpoint the patients are as a rule naturally strong healthy prolific women, with a tendency to obesity.

DURATION OF SYMPTOMS

90	patients	had	had	symptoms	for	1 year or less
86	"	"	"	"	"	1 to 2 years
89	"	"	"	"	"	2 to 3 "
71	"	"	"	"	"	3 to 4 "
42	"	"	"	"	"	4 to 5 "
150	"	"	"	"	"	5 to 10 "
52	"	"	"	"	"	10 to 15 "
31	"	"	"	"	"	15 to 20 "
20	"	"	"	"	"	20 to 30 "
12	"	"	"	"	"	30 to 38 "
17	"	"	"	"	"	"many years"
23	"	"	"	"	"	duration not stated
1	patient	"	"	"	"	"several years"

Thus 41.1 per cent of patients had had symptoms from one month to three years, 17.2 per cent had had symptoms from three to five years, 23.3 per cent from five to ten years, and 17.9 per cent from ten to thirty-eight years.

LOCAL EXAMINATION

When the uterus can be palpated through the inverted vagina and is found to hang below the plane of the introitus, the procidentia is complete. Complete procidentia was diagnosed in 100 cases of this series and 6 of these were unmarried patients. The condition is also found more often among the older patients whose small, atrophied uteri slip easily through a relaxed pelvic outlet. In the remaining 583 patients

the cervix protruded for a variable distance, usually 2 to 10 cm., depending on the amount of pelvic relaxation and cervical hypertrophy present.

OPERATIVE TREATMENT*

When operative procedures are undertaken for the treatment of procidentia the object in view is to remove diseased tissue and to restore the structures as nearly as possible to their normal anatomic positions and relationships. By 1905 it had become quite evident at this clinic that either vaginal or abdominal operation alone was inadequate for attaining anatomic results that would be permanent. Between 1905 and 1910 Dr. William H. Baker and Dr. William P. Graves developed a more or less standardized technic for performing the "double operation," i.e., the plastic vaginal operation and the abdominal operation for suspension. Except for minor variations the technic of the operative procedures has been as follows:

1. The cervix, which in most cases is hypertrophied, elongated and covered with cornified epithelium, is amputated according to Hegar's method. A circular incision is made below the level of the bladder and the endocervix is cored out for a variable distance, depending on the degree of elongation. The cervix is then amputated; bleeding vessels are ligated carefully, and the mucous membrane is stitched to the stump by interrupted sutures. The lower portion of the bladder is thus given a higher insertion on the uterus and can be suspended more adequately by the abdominal operation.

2. The cystocele is reduced by the operation of anterior colporrhaphy or colpoplasty. The object in this procedure is to remove redundant vaginal mucous membrane and to plicate the fibromuscular tissue lying between it and the bladder mucosa. It is frequently advisable to carry the denudation well down along the urethra and to plicate the periurethral tissues, especially at the neck of the bladder, in order to cure urinary incontinence.

3. The rectocele is reduced and the lacerated perineum restored to normal by the operation of perineorrhaphy or perineoplasty. In this procedure the object is to remove redundant vaginal mucous membrane, to plicate by means of the fascia the bulging lower portion of the rectovaginal septum, and to approximate the levator ani muscles in front of it for the purpose of making a new perineal body. A modified Emmet's perineorrhaphy was performed in earlier years, but later Clark's perineorrhaphy was adopted, since it effects a firmer and more permanent reduction of the rectocele than can be obtained by the Emmet method.

4. Abdominal operation. The object in this procedure is to utilize the abdominal wall and the ligamentous supports of the uterus to relieve the pelvic floor of some of its burden. In the absence of other pathology, if the uterus can be brought to the abdominal wall without leaving too much slack below, it is suspended by the Olshausen technic. The round ligaments, at a point usually about one centimeter from their insertions, are stitched to the lower abdominal wall on either side of the midline by means of doubled sutures. These are passed under the round ligament, through the abdominal peritoneum, rectus muscle, and aponeurosis and back through the same structures, so as to include enough tissue to give a firm hold for the knot which is tied tightly inside the abdomen. Frequently, if

*For a detailed description and illustration of the technical methods that are here only briefly mentioned, the reader is referred to Graves' *Gynecology*, 1928. Fourth Edition, Part III.

the patient has passed the menopause, the fundus between the round ligament fixation is scarified and sutured to the lower abdominal peritoneum to give additional support and to preclude the chance of intestinal obstruction. If it is evident that there will be too much "slack" with a simple suspension, or if other pathologic findings warrant, a supravaginal hysterectomy including tubes and ovaries is performed. The stumps of the round and broad ligaments are sutured to the cervical stump, the vesicouterine flap being drawn over all and sutured to the posterior side of the cervical stump. In some cases this has been considered sufficient support for the remains of the cervix and the vagina; but when this has seemed inadequate, the cervical stump has been fixed to the abdominal wall in the manner of an Olshausen operation. Braided silk (No. 7), doubled, was formerly used exclusively for suspending the uterus or the cervical stump, but in the last five years it has for the most part been given up in favor of catgut on account of the occasional danger of sepsis and persistent sinus. Silk, linen, and catgut have all been tried and silk has been found most effective. If catgut be used for the suspension sutures, the contiguous peritoneal surfaces included in the knot must be scarified.

5. Inasmuch as a diastasis, or separation, of the rectus muscles is usual in patients with procidentia, it is considered an important part of the reconstructive operation to approximate them. If the muscles are not brought together the abdominal wall is left weak and bulging, giving inadequate support to the viscera. The resulting poor posture contributes in varying degree to backache and pain in the flanks. Well-approximated rectus muscles are necessary for preserving the integrity of the uterine suspension. The technic of approximation is as follows: The midline incision is continued upward through the skin and fat for a distance of 5 to 12 cm. The opening in the aponeurosis, made by severing the umbilicus, is closed. The recti muscles are then approximated by placing interrupted figure-of-eight pulley stitches at the mesial edges of the muscle sheaths. These sutures when tied, plicate the intervening fascia. The suture material used is No. 2 tanned catgut, doubled. Care must be exercised to avoid pinching or otherwise traumatizing the intestines during this part of the operation. It is performed before the peritoneum is closed. Approximation of the recti muscles was a part of the operative procedure in 139 cases of the present series.

If the procidentia is large and there is doubt about the patient's general condition and ability to undergo a long operation, it is customary to perform the reconstruction in two stages, the second operation being done two to four weeks after the first. In this event repair of the cystocele and rectocele, or only the rectocele, is deferred until the second operation. In the series under consideration the reconstruction was completed in two operations in 192 cases. A few patients refused to undergo the second stage.

In 14 cases, before 1916, a modified Moschowitz operation was performed where there was a deep pouch of Douglas, the object being to avoid a recurrent rectocele. Since the adoption of Clark's operation, closure of Douglas' pouch has been found to be unnecessary, and has for the most part been abandoned.

After due consideration of size of family, age, amount of responsibility and work and general physical condition, sterilization, without hysterectomy, was performed on 14 patients.

REASONS FOR NOT OPERATING

Of 80 patients receiving no operative treatment:

- 27 refused operation.
- 19 were considered poor circulatory risks.
- 12 had diabetes.
- 6 were sufficiently relieved by a pessary.
- 4 were evidently pregnant when admitted.
- 4 had colds and did not return for operation.
- 3 were very old.
- 2 were excessively obese.
- 2 had malignant disease.
- 1 had pulmonary tuberculosis.

TREATMENT AND RESULTS

Incomplete plastic operation without laparotomy. Under this heading are included those patients who had either one or two out of the three plastic operations of amputation of the cervix, anterior colporrhaphy and perineorrhaphy. These operations were all performed before 1900. The total number of cases was 15. There were three operative deaths. Seven are untraceable.

	Complete Recurrence	Recurrent Cystocele and Rectocele	Recurrent Cystocele
6 months or less after operation	1		
6 months to 1 year after operation	1		1
1 to 2 years after operation		1	
3 to 5 years after operation		1	
Only two cases may be considered relieved.			

Abdominal operation only. There were 10 patients in this group. Six had hysterectomies performed; 4 had suspensions. Three are untraceable.

	Well	Cystocele and rectocele	Complete re- currence and postoperative hernia
6 months or less after operation	1		
6 months to 1 year after operation		1	
2 to 3 years after operation	2		
3 to 5 years after operation	1		1
5 to 10 years after operation	1		
6 cases may be considered relieved.			

Complete plastic operation without laparotomy. This group includes those cases where either trachelorrhaphy or amputation of the cervix was combined with anterior colporrhaphy and perineorrhaphy. There were thirteen in this group. Vaginal hysterectomy was performed once, trachelorrhaphy four times, and amputation of the cervix eight times. Four patients could not be traced.

	Complete Recurrences	Rectocele	Well
6 months or less after operation	2		2
6 months to 1 year after operation			1
1 to 2 years after operation		1	
3 to 5 years after operation	1		
10 to 15 years after operation			1
15 to 20 years after operation		1	
2 cases may be considered cured and two relieved.			

Incomplete plastic operation and laparotomy. The patients in this group had one or two of the three plastic operations of amputation of the cervix (or trachelorrhaphy) anterior colporrhaphy and perineorrhaphy and in addition a pelvic operation by the abdominal route. There were 192 in this group.

Trachelorrhaphy was performed on 5, amputation of the cervix on 131, supravaginal hysterectomy with modified Olshausen's suspension of the cervical stump on 72, Olshausen's suspension on 62, ventral suspension on 36, supravaginal hysterectomy on 12, Alexander's suspension on 5, Mayo's suspension on 3, Simpson's suspension on 1, and exploratory laparotomy only on 1 (cancer). There were five operative deaths, 2.6 per cent. Forty-six patients could not be traced.

INCOMPLETE PLASTIC OPERATIONS WITH LAPAROTOMY

	COMPLETE RE- CURRENCE	CYSTOCELE AND RECTOCELE	CYSTOCELE	RECTOCELE	CYSTOCELE AND POSTOPERATIVE HERNIA	POSTOPERATIVE HERNIA	WELL
6 months or less after operation	2	6	2	8		1	12
6 months to 1 year after operation	1			4		1	6
1 to 2 years after operation	4		3				9
2 to 3 years after operation				1		1	10
3 to 5 years after operation		1	2	4	1		14
5 to 10 years after operation		1	1	2	1	1	25
10 to 15 years after operation	1	1	1				13
15 to 20 years after operation		1					

One patient with a complete recurrence had gone to work in a factory three months after operation. One patient with a recurrent cystocele and rectocele had had a severe cough before the recurrence was noticed. Eight patients, 5.6 per cent, developed complete recurrences, seven of which occurred before two years had passed. Of those who had complete and partial recurrences (cystocele or rectocele or both) 60 per cent noticed them before two years had passed after operation, while 40 per cent noticed them three to twenty years afterward. Sixty-three per cent of this entire group were anatomically cured when seen from one month to fifteen years after operation and 12 per cent more were cured from three to fifteen years before recurrences were noticed. In a number of instances patients who were symptomatically well were found to have partial recurrences.

Complete Plastic Operation and Laparotomy.—This group comprised 338 patients. Trachelorrhaphy on 32; amputation of the cervix, 304; supravaginal hysterectomy with modified Olshausen's suspension of the cervical stump, 114; Olshausen's suspension, 145; ventral suspension, 38; supravaginal hysterectomy, 28; Alexander's suspension, 6; Mayo's suspension, 3; Simpson's suspension, 1; Baldy's suspension, 1, and complete abdominal hysterectomy, 2. There were six operative deaths, 1.77 per cent. Thirty-four patients could not be traced.

COMPLETE PLASTIC OPERATIONS WITH LAPAROTOMY

	COMPLETE RECURRENCE	CYSTOCELE AND RECTOCELE	CYSTOCELE	RECTOCELE	CYSTOCELE AND POSTOPER- ATIVE HERNIA	COMPLETE RECURRENCE AND POSTOPERATIVE HERNIA	RECTOCELE AND POSTOPERATIVE HERNIA	POSTOPERATIVE HERNIA	WELL
6 months or less after operation	2	3		2			1	1	43
6 months to 1 year after operation	1	2		1				1	17
1 to 2 years after operation	1	1	1	2	2	1		1	22
2 to 3 years after operation	1	3	2					1	15
3 to 5 years after operation	3	3	2	3					50
5 to 10 years after operation		3	1	3	1	1		3	48
10 to 15 years after operation	1	1	3					1	31
15 to 20 years after operation		1	2					1	7

Three recurrences (two were complete and one was partial) occurred after sudden physical strain. There were in all in this group, eleven complete recurrences, 3.6 per cent, 5 of which occurred after the three-year interval. There were 45 partial recurrences, 15.1 per cent, many of which were of a moderate degree. Those patients who were cured from one month to twenty years after operation comprised 78.2 per cent of this entire group, while those cured from three to twenty years comprised 58.3 per cent.

Secondary operations.—Thirty-four patients had more than one operation at this clinic for complete or partial recurrence. Eight of these are included among those who became pregnant after operation (see below). The remaining are briefly summarized as follows:

1. (A) Interposition operation. (B) Vaginal hysterectomy six months later for a complete recurrence. (C) Lateral vaginal walls sutured together four months later for complete recurrence.

2. (A) Interposition, perineorrhaphy, and Alexander's suspension. (B) Interposition and perineorrhaphy three months later for complete recurrence. One year later patient had an umbilical and bilateral inguinal hernia.

3. (A) Perineorrhaphy and Alexander's suspension. (B) Amputation of cervix and perineorrhaphy two months afterward for complete recurrence. Untraceable.

4. (A) Vaginal hysterectomy, anterior colporrhaphy, perineorrhaphy, and Alexander's suspension. (B) Anterior colporrhaphy and perineorrhaphy five months later. Untraceable.

5. (A) Amputation of cervix, anterior colporrhaphy, and perineorrhaphy. (B) Perineorrhaphy and ventrofixation one year later for complete recurrence. Rectocele present one year afterward but no worse when seen ten years afterward.

6. (A) Anterior colporrhaphy, perineorrhaphy, Olshausen's suspension. (B) Amputation of cervix and supravaginal hysterectomy with suspension of stump seven years three months later for recurrence. Cured eleven years six months after second operation.

7. (A) Anterior colporrhaphy, perineorrhaphy, and Olshausen's suspension. (B) Perineorrhaphy and Olshausen's suspension eight months later for complete recurrence. Dead, cause unknown, three years three months later.

8. (A) Amputation of cervix, anterior colporrhaphy, perineorrhaphy, Olshausen's suspension, and repair of ventral hernia. (B) Perineorrhaphy, supravaginal hysterectomy with stump suspension, and repair of postoperative hernia eight years later for rectocele and hernia. Cured nine years after second operation.

9. (A) Complete plastic operation, supravaginal hysterectomy with cervical suspension. Complete recurrence four years nine months later. (B) Plastic and suspension of cervix twelve years later. Cured three years after second operation.

10. (A) Complete plastic and Olshausen's suspension. (B) Plastic and hysterectomy with suspension three years later for recurrence. (C) Perineorrhaphy, suspension of cervix, Moschowitz operation and repair of postoperative hernia for complete recurrence five years after second operation. The third operation was followed by a recurrence in less than a year. The patient was alive with a complete recurrence and urinary incontinence ten years after her third operation and 24 years after her first operation.

11. (A) Plastic and suspension, recurrence four months later. (B) Complete plastic and hysterectomy with suspension ten years later. Complete recurrence two years after second operation.

12. (A) Incomplete plastic and suspension. Recurrence and postoperative hernia eight months later. (B) Five years six months later partial plastic, ventrofixation and repair of hernia. Cured three months after second operation.

13. (A) Complete plastic and hysterectomy with suspension. (B) Vaginapexia two years later for complete recurrence. (C) Repair of postoperative hernia three years four months after second operation. Complete recurrence five years nine months after second operation.

14. (A) Partial plastic and hysterectomy. (B) Suspension of cervical stump six months later. Cured thirteen years later.

15. (A) Complete plastic and suspension. Cystocele four years later after cough. (B) Plastic and suspension five years after first operation. Cured one year six months later.

16. (A) Complete plastic and suspension. (B) Perineorrhaphy for recurrent rectocele three years later. Cured twelve years four months later.

17. (A) Complete plastic and suspension. (B) Perineorrhaphy for recurrent rectocele three years later and cured ten years later.

18. (A) Complete plastic and suspension. (B) Perineorrhaphy and ventrofixation nine years later for partial recurrence. Cured four years after second operation.

19. (A) Ventrofixation. (B) Complete plastic, hysterectomy with suspension of cervical stump and repair of postoperative hernia for complete recurrence one year after first operation. Well until death five years after second operation.

20. (A) Complete plastic and hysterectomy with stump suspension. Cystocele and postoperative hernia following cough ten months later. (B) Plastic and repair of hernia one year later. Cured eight years nine months after first operation.

21. (A) Complete operation. (B) Perineorrhaphy ten months later for recurrent rectocele. Cured nine years later.

22. (A) Complete operation. (B) Plastic for recurrent cystocele and rectocele seven years later. Cured three years after second operation.

23. (A) Amputation of cervix and hysterectomy. Cystocele, rectocele, prolapse and postoperative hernia five months later. (B) Complete operation. Cured seven years after second operation.

24. (A) Complete operation. (B) Perineorrhaphy for recurrent rectocele three years four months later. Cured two years three months after second operation.

25. (A) Complete operation. (B) Perineorrhaphy two years later. Cured four years four months later.

26. (A) Complete operation. (B) Plastic and suspension of cervix eleven months later for complete recurrence. Untraceable.

Thus, of this group of 26, three are untraceable, eight were final failures and eighteen, or 69.2 per cent, were final cures.

OPERATIVE MORTALITY

There were fourteen operative deaths out of 603 patients operated upon, or 2.31 per cent. Four were due to embolus (one day, one day, thirteen, and sixteen days after operation); three were due to pneumonia (three, four, and sixteen days after operation); three were due to acute circulatory decompensation (two, two, and three days after operation); two were due to peritonitis and two were due to sepsis (fifteen and thirty days after operation). The average age of this group is 57.2 years which is eight to ten years above the average age for the whole series.

ASSOCIATED PATHOLOGY

Since the cervix in procidentia is outside of the vagina, it is exposed to constant friction with the result that the epithelium becomes thickened and cornified and gives the protruding mass a grayish-white appearance. The cervix also becomes longer and larger as a result of hypertrophy of connective tissue following the edema, congestion drag, torsion, and unusual motion of such a dependent mass. In 22.5 per cent of cases the cervix was ulcerated in one or more places. The ulcers are the result of erosion and infection. They heal slowly unless properly treated. If the mass is pushed back into the vagina and the patient is kept in bed and given daily douches, they heal usually in less than two weeks. Acute infection of the amputated cervix was noted three times microscopically; hypertrophy and chronic cervicitis were diagnosed in practically every amputated cervix. Twenty-seven patients had a cervical polyp. Despite the pregnancies, the instrumental labors, and the irritation; despite the leucoplakia, hypertrophy, impaired circulation and infection, conditions which predispose to carcinoma in the normally located cervix, only one patient of the whole series had carcinoma of the protruding cervix. (This was the only case ever seen at this clinic and the only case seen by any of the staff members in their entire experience.)

One patient had a fibroma of the vulva; two had bleeding hemorrhoids; nine had complete laceration of the perineum and four had a cyst of Bartholin's gland.

Other associated pathologic conditions were as follows:

Uterus: Acute endometritis, 2; chronic endometritis, 18; glandular hyperplasia of the endometrium, 47; chronic metritis, 2; endometrial polyp, 12; adenomyoma, 4; and fibromyoma (single or multiple), 73.

Peritoneal adhesions were found in the pelvis in only 21 cases, 3.6 per cent, and in 9 of these they were due to gross adnexal inflammatory disease.

Fallopian tubes: On microscopic examination subacute salpingitis was diagnosed twice and chronic salpingitis 104 times. No salpingitis isthmica nodosa was noted.

Ovaries: Chronic ovaritis, 38; simple serous cystoma, 8; dermoid cyst, 6; pseudomucinous cystadenoma, 6; fibroma, 5; benign papillary serous cystadenoma, 5 (the cystadenoma was bilateral in three of these cases); endometrioma, 2; malignant papillary serous cystadenoma, 2; and myxoma, 1.

Vermiform appendix: Microscopic diagnosis: Chronic appendicitis, 84; acute, 2; subacute, 2; atrophy and fibrosis of appendix, 22; and carcinoid tumor, 2.

Gall bladder: One patient had a cholecystostomy for stones at the time of operation for procidentia, and five had cholecystectomy for stones at a variable length of time after the procidentia operations.

Malignant disease: One patient had had a breast removed for carcinoma four years before her operation for procidentia. At the time of procidentia operation or exploratory laparotomy two patients had a malignant ovarian cyst, one had advanced peritoneal carcinomatosis, one had carcinoma of the body of the pancreas and one had carcinoma of the protruding cervix. Three other patients had operations for carcinoma of the breast, one, four, and nine years after the procidentia operation.

Thus malignant disease is known to have occurred in nine patients of the whole series, 1.31 per cent, and malignant pelvic disease in only three, 0.43 per cent.

Diabetes: Twelve patients were not operated on because of sugar in their urine. One patient had urinary sugar at the time of operation; one had no sugar at the time of operation but showed it five months later. Two patients had sugar, two and thirteen years after operation, and one died of diabetes seven years five months after operation. Total, 17.

Hernias: Before operation at this clinic three patients had had repair of an inguinal hernia, three had had repair of postoperative hernia and one had had repair of an umbilical hernia. At the time of admission 31 patients had an umbilical hernia (these varied in size from 1 to 15 cm. in greatest diameter), eight had an inguinal hernia, six had postoperative hernia, and one had bilateral femoral hernia. Of the 572 patients in this series who had abdominal operation, 23, or 4.02 per cent, are known to have developed postoperative hernias three months to nine years later. Four of these patients had had the operation of approximation of the abdominal recti.

PREGNANCY AFTER OPERATION

Fourteen of those patients who were traceable became pregnant after operation:

1. *Normal labor one year after a complete operation for procidentia.* Plastic, hysterectomy, and cervical suspension fourteen years later for partial recurrence. Perineorrhaphy, suspension of cervix and repair of postoperative hernia three years six months after second operation. Cured one year after third operation.

2. *Normal labor and complete recurrence one year three months after an incomplete operation.* Then followed another labor and two abortions. Complete plastic and suspension fifteen years five months after first operation. Cured two years four months after second operation.

3. *Abortion at three months one year after a complete plastic and suspension.* No recurrence two years five months later.

4. *Normal labor two years after a complete plastic operation.* Complete operation with hysterectomy and hemorrhoidectomy six years nine months after first

operation. Suspension of cervical stump and approximation of recti one year two months after second operation for slight prolapse and umbilical hernia. Post-operative hernia repaired six months after third operation. Patient complained of incontinence of urine and hemorrhoids but had no recurrence twenty-two years after first operation.

5. *Normal labor three years after a complete plastic and suspension.* No recurrence eleven years two months later.

6. *Incarcerated pregnant uterus resulting in a five-months' miscarriage,* a recurrent cystocele and a third degree retroversion two years two months after a complete plastic, Baldy suspension and shortening of the uterosacral ligaments.

7. *Normal labor and a complete recurrence one year one month after a complete plastic operation and suspension.* Complete operation with hysterectomy four years seven months later. Perineorrhaphy, modified Mosehowitz and vaginapexy ten months after second operation for partial recurrence. After third operation pelvic sepsis occurred, drainage was instituted and the patient was finally discharged against advice with a ureteral fistula.

8. *Normal labor one year eleven months after an incomplete plastic and suspension.* Patient well with no recurrence nine months later.

9. *Cesarean section and then a miscarriage after a complete plastic and suspension.* Postoperative hernia five years later. Seven years later a supravaginal hysterectomy was performed and the hernia repaired. The patient was well three years five months after the second operation.

10. *Normal labors one year six months and three years after a complete plastic and suspension.* Patient well twelve years nine months after operation.

11. *Four months' miscarriage one year seven months after amputation of cervix and suspension.* Well nine years after operation.

12. *Six months' miscarriage one year after a complete plastic and suspension.* One year nine months later plastic and suspension for a recurrent cystocele, rectocele and prolapse. Patient was cured five years seven months after second operation.

13. *Normal labor and complete recurrence two years four months after a complete plastic and fixation.* Plastic and hysterectomy three years four months later. Patient was well seven years after second operation.

14. *Cesarean section one year three months and two years eleven months after a complete plastic and suspension.* Abortion at two and a half months, three years eight months after operation. Patient was well six months later.

Thus five patients had normal labors with recurrences, three had normal labors without recurrences, two had cesarean sections, two had miscarriages with recurrence, one had a miscarriage without recurrence, and one had an abortion without recurrence. Twelve were final cures and two were final failures.

DISCUSSION

Not one of the patients in this series was of the negro race. There is a much higher percentage of pelvic inflammation among colored women and procidentia is uncommon among those with pelvic inflammation. Furthermore, the majority of colored women have contracted pelves which bring the bony supports of the pelvic diaphragm nearer to the points of strain and torsion. In addition it has been very rare at this clinic to see a colored patient with a hernia, which is evidence that colored women have better tissue tone and elasticity.

The occurrence of procidentia in 26 patients who had never been pregnant, and in six who had had only abortions or miscarriages, would indicate that in some instances at least there is a qualitative inferiority of the tissues. In 35 per cent of this series the onset of procidentia was ten or more years after the preceding labor and was associated with tissue atrophy. The partial and complete recurrences after complete and multiple operations cannot all be attributed to inferior technic or sepsis. Furthermore, the occurrence of some form of hernia in 10.98 per cent of the whole series and of postoperative hernia in 4.02 per cent of those having laparotomy at this clinic seem to point to a deficiency of tissue tone. At operation it has been a common experience to note the poor quality of tissues, friable, easily torn vaginal membrane; atrophied levator muscles; friable, greasy subcutaneous abdominal tissue; thin aponeurosis; flat, pale rectus muscles; tenuous peritoneum, and marked atrophy and inelasticity of the uterus and its supports.

In twenty instances operation failed to cure the urinary incontinence, although it brought about relief. In five instances patients complained of urinary incontinence after operation, not having had the trouble before.

One patient died of intestinal obstruction six months after operation.

In calculating results in this report the criteria as to cures and recurrences have been based on the anatomic findings. In many instances, however, patients have been cured symptomatically, but have been found on examination to have a moderate cystocele or a fair sized rectocele. It should be emphasized that the cervix in these cases was well held up. When symptomatic recurrences were complained of, the cervix was found prolapsed.

SUMMARY AND CONCLUSIONS

1. Six hundred and eighty-three cases of marked uterine prolapse, i.e., procidentia, have been studied from many angles, special emphasis being laid on the most effective type of operative treatment as indicated by long time results.

2. The family histories of the patients of this series were not remarkable, the percentages for tuberculosis, 7.6, and for malignant disease, 6.7, being similar to those derived in other studies made at this clinic.

3. The past histories covered a wide range of infectious diseases and operations, of which a complete summary has not been presented. A past history of vaginal repair operation was given by 9.9 per cent of this series, of operation for suspension of the uterus by 3.3 per cent, and of previous operation for procidentia (not at this clinic) by 2.6 per cent.

4. Twenty-six patients had never been pregnant; nineteen of these were unmarried.

5. The percentage of sterility for this series was 1.05.
6. The average number of children among the married patients was 3.92.
7. Symptoms of procidentia did not begin until after the menopause in 27.3 per cent of patients. Of the others 20.9 per cent had some menstrual abnormality, but in no instance was this a major symptom.
8. Normal deliveries were stated to have occurred by 45.3 per cent of patients; 54.7 per cent had had one to nine instrumental deliveries. Seven patients had had one breech delivery; four had given birth to twins. Only two gave a history of toxemia and one of placenta previa.
9. Symptoms of procidentia began (from two weeks to forty-five years) after the patient's first labor in 152 instances, 23.3 per cent of cases.
10. In 48 per cent of patients symptoms began one month to three years after the preceding labor; in 16.6 per cent they began three to ten years later; and in 35 per cent they began from ten to forty-five years afterward.
11. Functional incontinence of urine, usually not marked, was complained of by 31.3 per cent of patients.
12. That a condition of procidentia does not seem to incommode this class of patient seriously is indicated by the fact that 72.5 per cent had had symptoms longer than two years, and 41.2 per cent had tolerated the inconvenience from five to thirty-eight years before resorting to treatment.
13. The procidentia was complete in 14.6 per cent of cases.
14. Eighty patients, 11.7 per cent, received no operative treatment.
15. A study of end-results on the basis of 84.1 per cent of follow-ups shows that in those cases where the incomplete plastic operation and abdominal suspension were performed about 70 per cent were anatomic cures and about 75 per cent were symptomatic cures. When the complete plastic operation and abdominal suspension were performed about 80 per cent resulted in anatomic cures, while about 84 per cent were symptomatically cured. By anatomic cure is meant entire absence of retrocele, cystocele, or prolapse of the cervix below its normal level in the pelvis, as determined by examination. When complete operations were performed no marked difference in results was obtained, whether simple Olshausen suspension, ventrofixation, simple supravaginal hysterectomy, or hysterectomy with fixation of the cervical stump was done, although the results were somewhat better following hysterectomy with cervical stump suspension. Complete recurrences occurred in 3 to 6 per cent of the cases, partial recurrences in about 15 per cent. In cases where two, three, or even four operations were performed there were 69.2 per cent of final cures.

16. The operative mortality was 2.28 per cent. In this group the patients were, on the average, eight to ten years older than the average age for the whole series.

17. Despite apparently predisposing factors only one patient in this series had carcinoma of the cervix. Nine patients in all, 1.31 per cent, are known to have had malignant disease and only three of these had malignant pelvic disease. Good pelvic drainage, with absence of retained, chemically changed, irritating secretions, seems to be the most plausible explanation for this low cancer figure among women of the cancer age.

18. Gross chronic pelvic inflammation was found in only 1.57 per cent of the 572 patients who had abdominal operation. Chronic salpingitis was diagnosed microscopically in 18.1 per cent. No tuberculous salpingitis or salpingitis isthmica nodosa was noted. Benign ovarian tumors were found in 33 patients.

19. Fourteen patients became pregnant one to three times after operation. These pregnancies resulted in twelve babies, three miscarriages and four abortions. Pregnancy after operation resulted in 58.3 per cent of complete recurrences in this small group, whereas two patients underwent cesarean section with a successful outcome.

The writers wish to thank Miss A. R. Hickson, Miss I. C. Manson, and Miss D. I. MacCormick for much valuable assistance.

198 COMMONWEALTH AVE.

DIABETIC COMA COMPLICATING PREGNANCY*

BY MAXWELL S. MERRIAM, M.D., BROOKLYN, N. Y.

WHILE innumerable cases of diabetic coma complicating various other conditions have been reported, a careful search of the literature of the past twenty years has yielded the reports of only five cases dealing with diabetic coma complicating pregnancy. The rarity of this condition, therefore, justifies the report of the following case.

Mrs. J. P., aged thirty-six, Italian, housewife, mother of four children, was first seen by me at 3 P.M., December 15, 1925, complaining of abdominal pain and vomiting for the previous six hours. The examination proved negative except for slight indefinite tenderness over both lower quadrants, and the uterus which was the size of a seven months' pregnancy, with vertex presenting, and fetal heart in the lower left quadrant. She had always enjoyed excellent health, her previous pregnancies were normal, and her present pregnancy up to this time was entirely uneventful.

Twelve hours later the pains had become so severe that the patient was advised to enter the United Israel-Zion Hospital. On admission her temperature was 100°, pulse 126, respirations shallow and somewhat labored. In spite of the severe abdominal pains, however, there was no rigidity and but very little tenderness in

*Read at a meeting of the Brooklyn Gynecological Society, May 4, 1928.

both lower quadrants. Urine examination showed a few white blood cells, moderate number of granular and hyaline casts, heavy trace of albumen, 1.1 per cent sugar, and heavy acetone reaction. Blood examination showed erythrocytes 4,200,000, hemoglobin 82 per cent, 26,400 leucocytes, with 82 per cent polynuclears. The blood pressure was 145 systolic and 85 diastolic.

Within a few hours the patient's condition became markedly worse, and she sank into a deep coma. The respirations were deeper and more labored, of the typical Kussmaul type, the breath reeked of acetone odor, the pupils were dilated and reacted sluggishly to light, the mucous membrane of the mouth was parched, the teeth were covered with sordes, and the gums were bleeding. The heart sounds were normal except for the rapid rate. The lungs showed good resonance throughout. At this time, a diagnosis of diabetic coma was made, although the urinary findings and blood pressure suggested a possible renal complication.

The patient was given 1200 c.c. of 5 per cent glucose intravenously, and 40 units of insulin. The blood chemistry showed a blood sugar of 330, alveolar carbon dioxide of 8, urea nitrogen 15, and creatinine 2. Three hours later the patient's condition remained unchanged, and she was given 40 units of insulin intramuscularly, and 1500 c.c. of saline by clysis. Again three hours later she was given 1200 c.c. of 5 per cent glucose intravenously and 40 units of insulin. The alveolar carbon dioxide at this time was 12, the blood sugar was 160, the patient began to rouse somewhat and in two hours was fairly well out of her coma. The rapid and labored respirations however continued; although the pulse and general condition were much improved. In all, the patient had received 120 units of insulin, 2400 c.c. of 5 per cent glucose intravenously, and 1500 c.c. of saline by clysis, before coming out of the coma which lasted twelve hours.

Six hours after awakening from the coma, the patient complained of moderate abdominal pains, and definite uterine contractions could be felt. Within an hour, she delivered herself of a stillborn male fetus, weighing 3 pounds 4 ounces. Insulin was continued in doses of 15 units every three hours.

The following day, the alveolar CO₂ was 20, the blood sugar 235, and the clinical picture showed marked improvement, with the respirations less labored, the pulse 90, and of good quality, and the eyes clear.

From this time on, the patient showed continued improvement and as the amount of acetone and sugar decreased, the dosage of insulin was proportionately reduced. Within two weeks after her admission into the hospital the patient was discharged showing no acetone or sugar in the urine, with a blood sugar of 150 and alveolar CO₂ of 45.

For the first year, following her discharge from the hospital, it was found necessary to give her 15 to 30 units of insulin a day. During the past year, however, her condition has been controlled entirely by diet. At no time does the sugar in the urine exceed 2 per cent, and clinically she is in excellent condition.

COMMENT

It is interesting to note that of the five previously reported cases only one, that reported by Reveno,¹ in 1923, recovered. This patient who had been suffering from diabetes for several years, went into coma during the eighth month of her fifth pregnancy. After twelve hours, during which time she was given 52 units of insulin, she recovered from her coma enough to be roused, but the air-hunger, acetone odor, and high blood sugar persisted. Immediately after spontaneous delivery, however, there was a marked improvement in both her clinical and blood pictures. Reveno brings out the point "that in this respect the abrupt change simulated very closely the response of a patient suffering from one of the toxemias of pregnancy due to either therapeutic or spontaneous abortion."

Of the three cases reported by F. Ueber,² before the use of insulin, two were young women, twenty and twenty-two years of age, both severe diabetics who became worse during their menstrual periods, and who had been advised against both marriage and conception. They went into coma during the fifth and seventh months of their pregnancies, respectively, and in spite of the most rigid dietary treatment, died undelivered. The third, the mother of four children, suffering from an extremely mild diabetes, had a very uneventful pregnancy until her eighth month when she suddenly began to vomit and showed signs of impending coma. A cesarean section was performed, with the delivery of a 4½ pound baby which died of asphyxia twenty-four hours later. Following the section, her condition was the same except for the increasing coma, and she died shortly after.

The fifth case reported by Schottelius,³ a para iv, twenty-nine years of age, in whom diabetes evidently developed during the latter half of this pregnancy as evidenced by thirst, polyuria, and pruritus only at this time began, with headaches and vomiting in her seventh month of pregnancy. She went into coma during which she was delivered by insertion of a bag and deep cervical incisions, followed by a version and extraction of a macerated fetus. The patient died thirty minutes after delivery.

CONCLUSIONS

1. Only two cases, including the one presently reported, in which insulin was used, recovered.

2. Young women with diabetes, especially when aggravated during their menstrual periods, have the worse prognoses.

3. Even very mild diabetics may suddenly go into coma during pregnancy.

4. The use of insulin results in marked improvement immediately after delivery, similar to that noted in toxemias of pregnancy. However, the death of the fetus before delivery makes the prognosis much more grave because while the fetus is alive the fetal pancreas helps the mother in the carbohydrate metabolism.

5. Operative delivery during diabetic coma would seem to have as serious a prognosis as in eclampsia.

REFERENCES

- (1) *Reveno*: J. A. M. A. 81: 2101, December, 1923. (2) *Ueber*: Deutsche Med. Wchnschr. 46: 761, 1921. (3) *Schottelius*: Zentralbl. f. Gynäk., No. 23, 1912.

1270 FORTY-NINTH STREET.

Society Transactions

AMERICAN ASSOCIATION OF OBSTETRICIANS, GYNECOLOGISTS, AND ABDOMINAL SURGEONS

FORTY-FIRST ANNUAL MEETING

King Edward Hotel, Toronto, Canada, September 10, 11, 12, 1928

Dr. Palmer Findley, of Omaha, presiding. The following papers were presented in the order given:

DR. G. K. DICKINSON, Jersey City, N. J., read a paper entitled **The Liver as It Functions in Operations in the Female Abdomen.***

DR. L. E. PHANEUF, Boston, Mass., read a paper entitled **Complete Lacerations of the Perineum and Their Surgical Treatment.** (See page 475, April issue, for original paper.)

DISCUSSION

DR. JAMES E. SADLER, Poughkeepsie, N. Y.—It would seem to me, judging from these illustrations, that this is an operation which combines all the necessary details for an essentially good repair of the perineum. There are many and varied methods of repair of complete lacerations of the perineum. Some surgeons perform the operation in one way and some in another, but complete exposure of muscle ends and covering the sutures placed in the sphincter muscle are essential.

I differ with the doctor on one point. I have found for a number of years that through and through sutures in the perineum extending through the skin occasionally will get me in trouble, and hence I have abandoned that method and use only buried sutures with subcutaneous sutures for approximation of skin surfaces.

With reference to the prophylaxis, I am glad to know that in Boston they are seeing less and less of this complication. In New York State where I live and with a considerable knowledge of maternal conditions as they exist at the present time, I am sorry to say that I doubt very much whether there are less and less of these cases in our part of the country. At least I have not so noted in my practice. We have a maternal mortality rate of one death to every one hundred and seventy-one mothers, and that rate has not varied in twelve years; of necessity the morbidity conditions could not be expected to have materially improved. I am not saying this in regard to New York State alone, for the maternal mortality rate in my state is no greater, if as great, as exists in most or all of the states of this country. It seems to me that the prophylaxis and prevention of these terrible injuries should greatly appeal to an organization such as this.

DR. JOHN OSBORN POLAK, Brooklyn, N. Y.—I would like to emphasize a point in regard to prophylaxis. We have found in delivering patients with funnel pelves that the woman with the narrow bi-ischial diameter is the one who is going

*This contribution will appear in full, with discussion, in the current volume of the Transactions of the Association. It was necessary to omit some of the papers read, as well as parts of the discussions, for lack of space.

to rupture the posterior segment and that segment will be ruptured as a rule without injury to the levators if it occurs spontaneously, but if forceps are added there is injury to the levators, fascia and underlying structures. Prevention can be materially aided by preparation of the vulvovaginal orifice and by ironing out of the levators as suggested by Dr. Potter and in addition to this, dilatation of the sphincter ani muscle. After dilatation the sphincter retracts much better than before, and if it is injured, its repair is much more simple.

I have followed almost the same technic as that described by Dr. Phaneuf with the single exception that we have used the thin ends of silkworm gut for rectal sutures. These do not cut or become infected as silk or silk boiled in paraffin. The knots and ends are left long, tied together are brought out through the anus, which relieves the patient of gas and takes care of the drainage. These sutures come out spontaneously.

In an extensive dissection in such a region one is not likely to secure complete hemostasis, consequently I disagree with Dr. Sadlier as to the method of closing the skin. It is better to have fewer sutures and less tension on the skin so as to allow for drainage which always occurs immediately after such a procedure.

DR. CHARLES L. BONIFIELD, CINCINNATI, OHIO.—I rise to discuss the paper only from the standpoint of the secondary operation. For a good many years I have been obtaining equally good results by a much simpler procedure. I dissect the rectum loose, sufficiently high to enable me to pull down the apex of the tear to and through the sphincter. This makes it unnecessary to put stitches of any kind in the rectum. I then proceed to build up the perineum in the usual way. I use catgut exclusively and do not have these patients touched; if douches are given the catgut is apt to give out before the union is firm. In regard to starving a patient, they can go from ten to fifteen days but usually nine or ten days are sufficient.

As to the improvement in obstetrics in the last twenty-five to thirty years there has been marked improvement in one thing, that is we do not see the vesicovaginal fistulas that we used to see, but we do see more or less laceration of the perineum and of the cervix very frequently. I think the greatest cause of these lacerations is that so much obstetrics is done by the general practitioner who begrudges the time spent with the obstetric patient and applies forceps where if nature were given a chance the patient would deliver herself.

DR. F. S. WETHERELL, SYRACUSE, N. Y.—There are two points brought out in Dr. Phaneuf's paper, one of which I want to emphasize and to commend, and the other to question. In the matter of technic of leaving the bowels inactive for at least four to six days, whether it is a perineorrhaphy, or a postoperative abdominal surgical case, I heartily agree. I know from my own experience that following this method my patients are much more comfortable than if enemas are given and other means of purging are used, rather than using morphine to make the patient comfortable in the event of gas pains. Often the bowels will move of their own accord on the third, fourth, or fifth day.

The second point: If the doctor applies Dakin's solution every two hours, then he will get the effect that Dakin's solution is supposed to produce. It is inactive after two hours. He is then bound to have burns of the skin, and he is only adding to the possibility of morbidity of the wound. If the solution is used less than every two hours, water might be used just as well.

DR. IRVING POTTER, BUFFALO, N. Y.—I would like to speak only about the prevention of this condition. I do not know anything about the different methods of repair, but I will call your attention first to a careful study of your case; second, to a careful ironing out, slowly and easily, of the entire vaginal canal

before delivery. Third, I would again call attention to the fact that it is far easier to deliver a large head as an aftercoming head than it is as an oncoming head.

DR. EDWARD SPEIDEL, LOUISVILLE, KY.—As to the preliminaries of the operation, I consider the stretching of the sphincter a very important point. We give liquid petrolatum, a tablespoonful at bedtime for five days and castor oil on the sixth day, also injection of two ounces of liquid petrolatum instead of the olive oil that has been suggested. Then, of course, a limited diet is given in the intervening period in order to make the action of the bowels as soft as possible.

DR. PHANEUF (closing).—As to the question concerning Dakin's douches, I quite agree that water might give the same result. The patient might do perfectly well without douches. I have been in the habit of using a short douche for cleanliness. There is always more or less discharge following operation in the vaginal cavity, and I feel that I am getting better results by keeping those parts clean.

As far as these cases were concerned, I might add that the accidents followed delivery by forceps in practically every instance.

DR. R. R. HUGGINS, Pittsburgh, Pa., read a paper on **Problems Associated With the Cervix**. (For original article, see page 589, April issue.)

DISCUSSION

DR. JAMES E. KING, BUFFALO, N. Y.—It seems a very curious thing that an organ or structure that is as accessible to touch and sight as the cervix should have been so long neglected. About the first indication of any interest in the cervix was in the days of Emmett and Sims when they advocated repair of lacerations and showed the relationship to certain pathologic and clinical states. We have been content to operate on these cervixes but gave little consideration to other pathologic states to which they might be subject. Like almost all pathologic processes in other structures we find usually that the basis for pathologic change lies in infection. This is perfectly true of the cervix. Today we recognize various chronic and acute changes that the cervix undergoes following infection and have been able to evaluate the effect of such infection.

One of the questions of importance in regard to cervical infection following labor is whether the infection occurs at the time of labor in a lacerated cervix or whether it occurs at some time subsequently. In considering any infection, in whatever structure, for its understanding we must take into account the lymphatic drainage. There is probably no tissue that has a greater and richer lymphatic distribution than that of the uterus and cervix. About fifty years ago Leopold described the relationship of lymphatic vessels to the cervix and uterus, but we have really paid little attention to this particular subject in relation to infection. Treatment of infected cervixes has become standardized today, and none of us, I believe, amputate the cervix for simple infection because we have in cauterization a treatment which is most satisfactory. Personally, I have found no contraindication to its use nor have I seen any ill results from its proper employment. As to amputation of the cervix I believe that it is limited almost entirely to those cases in which the cervix is hypertrophied and where it is removed because of this hypertrophy.

Now just one word which I fear is heresy. I am somewhat reluctant to speak of it, but from my own personal experience I am not convinced that we are justified in considering that malignant change is so commonly the result of an infectious

process or of laceration of the cervix. Of course, in our approach to a diseased cervix it makes little difference, as all diseased or lacerated cervixes should be treated on general principles, but the question as to whether or not such cervixes really contribute so largely to the development of malignant disease is debatable. Personally, I have not been able to convince myself that it is so, and possibly we have been accepting and taking for granted textbook statements passed down through many years.

DR. JOHN OSBORN POLAK, BROOKLYN, N. Y.—In answer to Dr. King's question, many of you may have seen the work which Dr. Graves reported before the British Gynecological Society. To me it was particularly impressive. In his 581 cases of cancer of the cervix treated in the Free Hospital for Women there was definite history of traumatic labor in 96 per cent of the cases, while in 714 women who had had repair by trachelorrhaphy there was an incidence of 7 cases of cancer of the cervix. This to my mind brings out one point, that we have not only the injury but the incidence of infection as the cause of chronic irritation.

I have called attention to the importance of the care of these cases in the early weeks after confinement, for the best work can be done with the cautery in these early erosions. Bonney and others are all convinced that erosion, or infection and erosion, is the precursor of cancer.

One other important point, namely that we will get much better results in plastic work if we follow what our predecessors taught us, i.e., to cure the cervical infection before operation.

DR. GORDON K. DICKINSON, JERSEY CITY, N. J.—I think we should not get in the habit of arguing from a small horizon. We should philosophize from broad statistics. There are two questions to be answered if you are going to say that cancer of the cervix is due to traumatism. One is why is it so very rarely, almost never, that one sees cancer come to the cervix of a procidential inflamed uterus?

Another observation is that in various institutions and insane asylums cancer of the cervix did not develop in a patient who had come there free from cancer.

DR. ADAM P. LEIGHTON, JR., PORTLAND, MAINE.—It seems a pity that a paper of this kind cannot be put into the hands of the recent graduates in medicine and seniors in our medical schools. I have been a member of the Maine State Board of Registration of Medicine for fourteen years and have been the examiner in obstetrics and gynecology during this time. It is appalling to see the lack of understanding on the part of the recent graduates in regard to the treatment of this particular pathologic condition. At almost every examination I have asked a question concerning the treatment of leucorrhea, and in only a few instances has a recent graduate mentioned cauterization or surgery. They generally speak of simply douching, or a "D. and C.," which is old-time silly treatment. I approve of the treatment of endocervicitis and simple erosions by the cautery but also have had very good results with a Schroeder cervical amputation, and have found no particular difficulty with parturition which followed.

DR. JAMES K. QUIGLEY, ROCHESTER, N. Y.—I wish to comment on what Dr. Leighton has said as to the lack of knowledge on the part of recent graduates in regard to the treatment of endocervicitis. I asked that question at the last State Board examination and the answers received from about 50 per cent of the students were appalling. The cautery was not mentioned by more than 5 per cent.

I have seen stenosis result twice, but never dystocia from the use of the cautery.

DR. JENNINGS LITZENBERG, MINNEAPOLIS, MINN.—I am sorry Dr. King brought up a question which cannot be decided by discussion, that is the doubt

about the cause of cancer, which can only be decided by scientific investigation. I want to cite two authorities on the pathologic conditions of the cervix that certainly justify us in saying that the lacerated, infected cervix is the precursor of cancer. Bloodgood said that a cancer has never been found in healthy tissue. Another authority, W. J. Mayo, says that cancer has never been found where there is not chronic irritation. Those two authorities ought to settle the question as far as we can go. To doubt the cause of cancer is simply to say that we do not know the cause of cancer. That is true, but when the clinicians and pathologists agree that there is always chronic irritation where there is cancer, it certainly justifies us not only in treating these cervixes as Dr. King advocates but also in assuming that it will cause cancer if untreated, until it is decided what the cause of cancer is.

DR, JAMES F. BALDWIN, COLUMBUS, OHIO.—Dr. J. M. Baldy, then of Philadelphia, wrote an article a number of years ago in regard to irritation producing cancer of the cervix. The article was a strong one against the theory of lacerations being the cause of cancer. It was largely statistical and appeared in the proceedings of the American Gynecological Society. I have had so many cases of cancer of the cervix in virgins and in women who though married had never been pregnant and where there was no history or evidence of previous trouble about the cervix, that I have doubted very much whether we could assume logically that there is always a preceding irritation. One patient, a virgin twenty-four years old, had far advanced cancer of the cervix; two others twenty-seven years old, one married but never pregnant.

I have for years urged that in practically all cases in which a hysterectomy is made the cervix should be removed. The importance of this was brought forcibly to my attention a few months ago when I received a letter from a former patient in Cleveland. I had operated upon her eleven years before. She was a school-teacher with all the marks of virginity. There was present a large mass of fibroids and apparently a perfectly healthy cervix, and I did a supravaginal hysterectomy. She later married and her health for several years was absolutely perfect, and then she wrote me she had had for some months a bloody discharge. On receiving her letter I immediately wrote to her to see Dr. Lower, whose name she had mentioned, and to submit to any treatment which he might suggest and at once wrote to the doctor telling him all about the case. A few days later I received from him a report that he had found a hopeless mass of cancer which he was treating with radium. Her case made the thirty-second under my own observation in which cancer had developed in the cervix many years after the original hysterectomy, though very few of them in my own work. The result is that I practically never leave a cervix behind.

It is a mistake to claim that the mortality of complete removal at the hands of a competent surgeon materially, if at all, exceeds the mortality of the incomplete operation. If any operator finds any noticeable difference in mortality, it indicates in my judgment that he has never learned just how to remove the cervix.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—It seems to me the best biologic statement of the etiology of cancer can be given in these words: that it results from a continuous irritative stimulation without sufficient periods of rest to enable the cell or cells to recuperate to normal.

In regard to the illustrations it would seem that there should be no difficulty in diagnosing some of these slides as not indicative of cancer. When stratified squamous epithelium is isolated from its natural position, if it is to become cancer, it does not show any characteristics of a recessive growth change. If it is going to become cancer, there are appearances of a growth impulse. One can almost

always, I think, without hesitation, if he is an experienced reader of slides, avoid making such a mistake. The infolding of the stratified epithelium to a low position in the basement tissues does not necessarily signify malignancy so long as there is no active growth movement. If the tissue is recessive in appearance, it is benign.

DR. HUGGINS (closing).—Just a word about what Dr. Dickinson has said in regard to prolapse of the uterus. I think the reason why it so seldom happens is because the uterus and the cervix are in better condition hanging outside the vagina than buried deeply within the vagina, perhaps in actual contact with an infected secretion.

In regard to what Dr. Davis has said, these slides do not in any way represent doubtful cases of carcinoma. They were merely examples of how epithelium may be displaced and indicate the possibility of its behavior under different conditions.

DR. I. C. RUBIN, New York City, read (by invitation) a paper on **Utero-tubal Insufflation Followed by Pregnancy in 205 Cases Out of a Series of 2000 Cases of Infertility.** (For original article, see page 484, April issue.)

DISCUSSION

DR. W. T. DANNREUTHER, NEW YORK CITY.—In accord with Dr. Rubin's natural modesty he has not stressed one very important point, the necessity of following his technic. Obstetricians and gynecologists regard his work as one of the most valuable contributions presented during recent years. Some men, however, have reported untoward sequelae when Dr. Rubin's recommendations have not been closely followed, and I feel that it is extremely important to adhere to the original technic and apparatus. There have been many modifications of the apparatus and innumerable variations in technic. Personally, I have tried to follow Dr. Rubin's suggestions as they have been made from time to time, and my experience has been free from all unfortunate complications and results.

I have one or two definite impressions about the value of this procedure. One is that the large number of women who become pregnant after transuterine insufflation as contrasted with results from salpingostomy, which I probably did entirely too often before the days of the Rubin test. I have done 22 salpingostomies and have had pregnancy follow only once. On the other hand, I recall two private patients, both over thirty-five years old, one sterile for seven years and the other for eleven years, who became pregnant within sixty days after the employment of the Rubin test.

DR. A. J. RONGY, NEW YORK CITY.—There is no question that the Rubin test helps a great many women who previously have been sterile to become pregnant, and I believe I was one of the first to report this observation in a paper presented before this Association five years ago.

Of course, the trouble with statistics is that they cannot be quite exact. In a paper presented to this Association in 1919 I made an analysis of 1000 cases of primary sterility. That was before the days of the Rubin test. I then reported that a number of patients became pregnant, although no treatment had been given; in other words, the sterility in those cases seemed to be of constitutional origin. This may be permanent or transient in character. That is, the patient may be suffering from infertility temporarily or permanently. Now if women who are not treated become pregnant, naturally our statistics on this subject are not altogether accurate.

Another factor which enters into this calculation is that women who have tendencies to grow fibroids in later life or who have fibroid nodules are more prone

to become pregnant during the fourth decade of life than during the third. This fact should be taken into consideration in all statistical studies of primary sterility in women.

Dr. Rubin spoke of the question of operating for appendicitis on young girls. I believe that this operation in girls is a great factor in causing subsequent sterility particularly in cases that have been drained. I have insufflated a number of women who had had an appendix operation during their childhood or adolescence and found in many cases that the tubes were closed with no evidence of infection.

I agree with Dr. Dannreuther that salpingostomy as a cure for sterility should be abandoned. I have operated on a number of cases for the cure of sterility because of peritubal adhesions, and in only two did I have a cure. I believe that the patient who is given an opportunity for a spontaneous cure has a better chance for the tubes to open than the patient who is operated upon.

DR. G. D. ROYSTON, St. Louis, Mo.—I have insufflated about 255 patients for sterility, and among this number in 75 of the cases it was found that the husband was at fault. Fifty-one of the patients became pregnant, but I did not watch the figures as carefully as Dr. Rubin has done; 253 of these patients were insufflated in the office without untoward results, which speaks for its safety.

I also did other things in addition to the insufflation. I treated the endocervicitis with cautery, corrected the diet, and corrected displacement in some cases. Of the six cases where salpingostomy was done not one conceived. In certain cases of hyperacidity the use of 2 per cent bicarbonate of soda douches was followed by conception when nothing else was done. In two cases stopping the patients from smoking resulted in pregnancy. Whether that had anything to do with it or not I do not know. I think it is important to bear in mind that sterility may be caused by dietetic indiscretions or an overstrain in school during the period of adolescence. I am very positive that this subject of children being overworked at school during the years from thirteen to seventeen years should be looked into and that school work at home should not be given to our growing girls.

DR. WILLIAM A. COVENTRY, Duluth, Minn.—I have had quite a little experience in inflating tubes with the Rubin technic, and a number of these patients have become pregnant within sixty to eighty days after insufflation. Dr. Rubin says he has only used his graphic method during the last few years, and I would be interested in knowing what percentage of the cases that become pregnant showed a marked drop in the curve. I assume the idea was that there was an obstruction and the tube was opened so that the patient could become pregnant.

DR. ALEXANDER M. CAMPBELL, Grand Rapids, Mich.—I would not like to have the impression go out from this Association that salpingostomy is an entirely futile procedure. I would like to mention the statistics of Dr. Bethel Solomon, who has recently reported a large series in which he achieved 31 per cent of successes following salpingostomy, and I would further mention the fact that Drs. Gellhorn and Kerwin have recently reported fifty cases of salpingostomy in which 25 per cent of the patients became pregnant.

I believe that with the exact methods of determining the patency of the tubes, so wonderfully perfected by Dr. Rubin, and with the addition of the transuterine injection of lipiodol with roentgenography, that gynecologists are now in a position to attempt reparative surgery of the fallopian tubes in selected cases with a considerable hope of the restoration of fertility.

DR. RUBIN (closing).—I feel that the untoward results that Dr. Dannreuther mentioned as having occurred here and there are sometimes unavoidable. There are very few measures, indeed, whether therapeutic or diagnostic, in medicine that are not accompanied to some appreciable degree by hazard and untoward

sequelae. I have sought personally to safeguard this method as well as is humanly possible, and I am very greatly gratified that specialists in gynecology, members of this Association and of the American Gynecological Society, and others who are not so affiliated but who are conscientious and trained workers, have not had bad results.

I have called attention in a paper read in London to two of the first untoward results that I have been able to find out about, and I am convinced that those cases were unfortunate tragedies, absolutely avoidable. They were in the hands of men unqualified to do insufflation.

Regarding salpingostomy, which has been mentioned by practically every speaker, it was my early hope that efforts to reconstruct closed tubes would again be taken up in addition to insufflation and that the technic of salpingostomy might be perfected. I was very much encouraged by the report of Dr. Gellhorn that 25 per cent of his salpingostomies were followed by pregnancy. Dr. Childs of New York has also reported success, and it may be eventually we shall go back to salpingostomies. In my own experience I have had only one case, the wife of a physician in whom the tubes were undoubtedly stenosed as ascertained by several insufflations. I watched her for a year reluctant to do a laparotomy which was finally urged upon me by herself and her husband. I was able to check up the findings of the uterotubal insufflation aided by the kymograph in that case and as one of the slides showed there was a high pressure, 185 to 190 mm. Hg., and then a drop without any fluctuation. This finding indicated that she had adherent tubes, which was proved at the laparotomy. Following the operation a pressure of 110 mm. Hg. was obtained during the insufflation, and two months later pregnancy occurred. That is the only case I have mentioned of therapeutic insufflation in connection with operation.

The great trouble with salpingostomy is, of course, that the tubes seal over rapidly after the operation. It was my hope that through repeated tubal insufflation the tubes might be kept open.

There was an appreciable number of patients in this series who had high pressures, and in these the test was repeated therapeutically. In a number the pressure fell to within normal limits. In every case the pressure was appreciably reduced.

DR. J. W. KENNEDY, Philadelphia, Pa., read a paper entitled **Reactions of the Peritoneum**. (For original article, see page 636.)

DISCUSSION

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—I believe Dr. Kennedy is correct in his assumption that the increase in mortality of appendectomy and of many other operative procedures is due to the fact that incompetent men operate. A great many general practitioners, I am assured, feel competent to operate upon their appendix cases. A few years ago I was called to a small Ohio city to operate upon a case of appendicitis. The attending physician had invited several of his colleagues to accompany us to the house, and among them was a young man whom I did not know but who seemed to take a deep interest in the operative procedure. It was a pus case, and at its conclusion I gave the attending physician general directions as to the after-treatment and evidently spoke in an optimistic way. The young man referred to got me off to one side and anxiously asked me if I really expected the patient to get well. I assured him that I certainly did, of course barring accidents. His rejoinder was, "Well, mine have all died." I later found that he was trying to do surgery and evidently with unsatisfactory results.

Dr. Ochsner's paper describing what became known as the Ochsner treatment of appendicitis was widely published, and at that time I said its publication would do much more harm than good. Had it been read only by experienced surgeons, it would have done a great deal of good, but general practitioners for whom his address was not intended proceeded to adopt the Ochsner treatment and would delay for several days before sending for a surgeon, by which time there were complications resulting in many fatalities. His treatment is unquestionably, in occasional cases, life-saving, but such cases are exceptional and require the finest possible surgical judgment.

The essayist speaks of intestinal obstruction. Most surgeons, if drainage seems necessary in an appendectomy, put a drain in at the lower end of their incision. This means that the drainage wick or tube almost invariably lies in contact with the small intestine, with the result that in many cases an operation is necessary a few weeks later for intestinal obstruction. I prefer a fairly liberal right rectus incision, and in the exceptional case in which drainage is necessary, I make a stab incision well over to the right through which the drainage wick or tube is pulled from within out, the distal end of the drain being placed at the proper point. Over this the cecum is drawn and the omentum tucked in so that the small intestines are at no point in contact with the drain. The main incision is then closed as usual and intestinal obstruction is obviated.

Inexperienced operators are very apt to assume that the inflammatory lymph which appears when the peritoneum is opened is pus and as a result will sometimes put in several drains, none of which are necessary but only a menace. Such wounds can be closed without drainage, as emphasized a few years ago by Dr. Robert Morris, and with absolute safety to the patient.

DR. KENNEDY (closing).—I want to take this opportunity to pay tribute to one of our Fellows, Dr. Hertzler of Kansas, who has written a work of a thousand pages or more on the peritoneum. It is my opinion that this is one of the most valuable contributions that has been given us. This work is just what one might expect from so able a teacher. Dr. Hertzler has been a histologist, an anatomist and a pathologist and has had a large clinical experience in the broad field of surgery. He has brought forth arguments in the first volume of his work on the peritoneum which sustain my position in a publication made in 1910, namely, that it was not the peritonitis that was the final and fatal dose of toxins in the peritonitis abdomen but that the patient most often received such from the complications of the peritonitis, partial and complete bowel obstruction, distal abscesses, retroperitoneal infection, and so forth.

I find much in Dr. Hertzler's work which sustains the position we take that the reactions of the peritoneum are defensive and not offensive and permit us to do more radical work than is advocated in the present-day teaching.

DR. EDGAR A. VANDER VEER, Albany, N. Y., read a paper on **The Causation, Prevention and Treatment of Postoperative Distention of the Abdomen.** (For original article, see the current volume of the Transactions of the Association.)

DR. W. WAYNE BABCOCK, Philadelphia, Pa., read a paper entitled **The Vaginal Approach for Certain Intraperitoneal Operations.** (For original article, see page 573, April issue.)

DISCUSSION

DR. J. W. KENNEDY, PHILADELPHIA, PA.—If as thorough surgery can be done from below as from above, then the lower route must be chosen. We know

that twenty-five times as many people will die suddenly and tragically from the suprapubic hysterectomy as when the uterus is removed from below. I am unable to account for this but this tragic death rate from the suprapubic hysterectomy has driven us to doing over 95 per cent of our hysterectomies by the vaginal route, clamp method.

In regard to approaching the extrauterine pregnancy by the vaginal route, we have not done so, our work being done through the abdomen. There is no condition which shows such marked depression and extreme collapse that will stand abdominal surgery as well as the extrauterine pregnancy. Surgery seems to be welcomed.

I have always felt that there is a reciprocal relation in the extrauterine pregnancy between shock and intra-abdominal hemorrhage, and the symptoms of the extrauterine pregnancy are those of the shocked patient and not of intra-abdominal hemorrhage. We are all familiar with the comatose, pulseless, blanched patient from extrauterine pregnancy. It is a picture of profound depression. I speak of this reciprocal relation between intra-abdominal hemorrhage and shock to bring out this point. If intra-abdominal hemorrhage dominated the picture, we would have the wild, restless, active, ever-moving patient which is the classical picture of intra-abdominal bleeding, whereas the extreme picture of the extrauterine type is the resigned, quiet, easily nursed patient or that of typical shock.

DR. W. J. DIECKMANN, St. Louis, Mo., read (by invitation) a paper on **The Hepatic Lesion in Eclampsia.** (For original article, see page 454, April issue.)

DISCUSSION

DR. OTTO H. SCHWARZ, St. Louis, Mo.—During the latter months of pregnancy remnants of chorionic villi are constantly entering the blood stream. In order that this material may be broken up certain substances in the blood, most likely the proteolytic enzymes, must act against them. The hepatic lesion in eclampsia is a peripheral necrosis which is due to a coagulation of the blood in the tributaries of the portal vein. As this coagulation does not take place, except in extreme cases of eclampsia, in other parts of the body, it is logical to assume that a substance or substances which shorten the coagulation time are absorbed from the intestinal tract. It is assumed that in pregnancy substances are working against this placental material which is entering the blood stream and, therefore, similar substances which enter the portal circulation in greater concentration are not acted upon quickly enough to prevent this moderate degree of coagulation. Mills has shown that large molecules of protein material can actually be absorbed through the intestines and that the coagulation time in general is markedly shortened after a protein meal. That this shortening of coagulation time should be most marked in the portal system is a logical deduction; therefore, this can be shortened to even a greater degree on account of pregnancy in the human for reasons already stated. The experiments of Dr. Dieckmann have aimed at simulating the condition as it exists in human pregnancy. In this discussion we are only considering the cases of eclampsia which present the hepatic lesion. We believe that this lesion can be produced by substances which are absorbed from the intestinal tract. There may be some cases of eclampsia which have other sources of damaging material than the intestinal tract, such as a degenerating myomatous tumor of the uterus. Such cases would not show the liver lesion. A case of this kind actually came to our attention, and the autopsy findings show a markedly degenerating myoma, no liver lesion, and a typical picture of the kidney in eclampsia. This was a case of marked hypertension in a primipara who

had been in the wards for several weeks with no improvement in her condition. She died after a cesarean section, and the organs were examined at autopsy.

DR. PAUL TITUS, PITTSBURGH, PA.—We must not forget that the origin of eclampsia is a very complex affair. I do not believe that any one specific thing alone can ever be demonstrated as the sole cause of eclampsia.

In connection with this work I would like to raise two questions: Do the authors subscribe to or disagree with the idea that there is a definite distinction between the pathologic lesions of toxemia of early and of late pregnancy; and, in their experimental work, in addition to producing these significant pathologic lesions, were they ever able to cause dogs to have the clinical signs of eclampsia, namely the convulsions?

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—Some years ago a very noted research worker stated that no one was competent to discuss the experimental work of another person until he had gone through the same steps that the experimenter had taken. There is much truth in this statement, therefore one should only ask questions.

The lesion is spoken of as a hemorrhagic type and also as a thrombus. I have not clearly in my mind just what differentiation is made in the pathologic change produced in these two types of lesions. Do both types obtain or is it a dominating hemorrhagic picture? Has any study been made of the walls of the smaller vessels? It is fairly common to find in eclampsia changes in the smaller vessels of the brain, such as minute hemorrhages. It is also a common thing to see hemorrhages in the liver and also in the kidney, as has been mentioned. I am wondering whether the same condition might be produced by the injection of other substances. This brings up the question of the advisability of having different controls.

DR. E. D. PLASS, IOWA CITY, IA.—There are three facts of clinical significance which I think should be always considered in speaking of a new theory on the etiology of eclampsia. Eclampsia occurs in primiparous women or in those who have a multiple pregnancy or hydramnios. I would like to ask the investigators how they are able to correlate their theory of the causation of eclampsia with these facts of clinical incidence?

Reference has been made in the discussion to the fact that there is no such thing as a typical lesion of eclampsia. There is a textbook picture of eclampsia which one occasionally sees, but my own experience has been that the average eclamptic patient who comes to autopsy does not approximate this picture. That being the case, it is, I think, distinctly unwise to look upon the liver lesion as being essentially primary and that would in itself make such liver lesion secondary to some other more far-reaching, perhaps some metabolic, disturbance.

There is one other point I would like to bring out. The investigators have mentioned the possible significance of an overingestion of protein during the latter months of pregnancy as of etiologic importance. It is unnecessary to emphasize that in any condition where there is a lowered protein there is an increased intake of other food materials in order that the patient may have a sufficient caloric intake. It is evident that there must be an increase in the carbohydrate intake as a partial compensation. Moreover, a diet low in protein is a diet high in the inorganic constituents, a fact which may be significant.

DR. HARDING, TORONTO, ONTARIO.—I have listened with profound interest to the description of Dr. Dieckman's and Dr. Schwarz's experimental production of a type of lesion in the liver approximating that found in the so-called classical picture of eclampsia; but, like Dr. Plass, I am not entirely convinced that the

liver picture, as it is usually designated, is so absolutely an essential part of eclampsia. I have not in my own mind been able to separate from what clinical evidence I have seen, into any distinct class the convulsive type and that type of disturbance which is generally known as a preeclampsia. There is little time for observation work in the convulsive type of disturbance; but if we assume that the symptoms of eclampsia and preeclampsia are multiform expressions of one underlying disturbance, I cannot quite see the force of the argument that low protein feeding will act in any prophylactic manner against eclampsia. Prenatal care does, but you cannot disturb the picture of preeclampsia at all by protein feeding. The patient will improve on a high protein diet provided it is salt-free and combined with rest in bed.

DR. DIECKMANN (closing).—In answer to Dr. Titus' question as to the similarity between early and late toxemia of pregnancy, we believe there is no relation between vomiting of pregnancy and eclampsia except that they both occur only in pregnant women. As to convulsions in our animals, I have let none live longer than five days. There are tonic and clonic movements with respiratory difficulty following a lethal injection of tissue extract. As soon as the animals are sick, or at the end of five days I have killed them; for if they were left to die, postmortem changes would set in so rapidly that findings would have no significance.

In regard to the thrombosis and hemorrhage of which Dr. Davis spoke, the primary lesion in eclampsia is a thrombosis in the small capillaries of the portal system followed by hemorrhage with subsequent necrosis. We have not studied any of the other organs. The kidney macroscopically shows some changes.

Answering Dr. Plass, in primiparae and in twin pregnancy there is an increased intrauterine pressure and also an increased intra-abdominal pressure. Also in twins the placental surface is greater. It has been shown that absorption of protein from the intestines varies directly as the intra-abdominal pressure. Dr. Plass also states that certain cases of eclampsia do not show the liver lesion. Schmorl in 71 out of 73 autopsies on women dying from eclampsia was able to find peripheral hemorrhage and necrosis of the liver, some, however, being microscopic. On a number of animals subcapsular hemorrhages could be seen following the first injection. Tissue was removed from one dog at this time and showed the typical peripheral hemorrhage found in eclampsia.

DR. JOHN OSBORN POLAK, Brooklyn, N. Y., read a paper entitled **Is Surgical Intervention Justifiable in the Treatment of Metrophlebitis and Thrombophlebitis of the Pelvic Veins?** (For original article, see page 467, April issue.)

DISCUSSION

DR. BROOKE BLAND, PHILADELPHIA, PA.—I have long been under the impression that ligation or excision of the parauterine veins was not to be considered a proper measure in general infection originating in the uterus. This idea has been fostered first by the generally unfavorable reports found from time to time in the literature and second because the procedure has never made an appeal to me as a worth-while operation. I am unable to understand how a general septic process with virulent streptococci circulating in the blood stream would be modified by ligating or excising the broad ligament veins, an operation by no means easy and, I should say, inevitably more or less incomplete. To me it seems physically impossible by the technic in vogue to ligate or excise successfully all the broad ligament veins, unless the broad ligament itself were severed from its

free margin to the very depths of the pelvic diaphragm. Even with such a radical measure I would still remain skeptical as to whether all the infected thrombi were adequately cared for.

Pelvic phlebectomy has never proved an alluring procedure to me nor has any other form of pelvic surgery in widespread blood-stream infection, and I assume that all these cases are associated with more or less bacteremia. So far as I have been able to determine a passive policy seems to accomplish more than any form of operative interference thus far advocated and practiced.

DR. JENNINGS LITZENBERG, MINNEAPOLIS, MINN.—Dr. Polak's conservative position is exactly that which we have taken at the University of Minnesota, for we have done no operations in these cases for a number of years.

The papers which have been presented upon this subject advocating operation are the best arguments that I can present against them.

We have in Dr. Polak's paper a crystallization of the modern ideas on this subject harmonizing the clinical and pathologic aspects which lead to the same inevitable conclusions that pathologically operation would appear to be unsound and in his own clinic his results with conservative treatment condemn the operation.

DR. ASA B. DAVIS, NEW YORK CITY.—I have no definite statistics to offer but have had some experience which confirms what Dr. Polak has said. In our Lying-In service since 1890 we have taken care of, in round numbers, over 160,000 deliveries. I have been in rather close touch with the service during that time. In this number of cases, drawn from tenement districts, from midwives, from incompetent and unfortunate doctors, we have had our share of septic cases and of thrombophlebitis of the pelvic veins. We have learned to avoid any interference or operations in these latter cases. We place them in the solarium, give them good nursing and such food as they can take, and evacuate collections of pus if they appear. In late years we have found that small blood transfusions repeated at a week or ten-day interval have been decidedly helpful. This does not cure all these cases, but undoubtedly some that would otherwise die are saved in this way. Professor Trendelenberg was among the first to operate for this condition many years ago. According to my recollection he reported three cases. I have never been able to determine the time when one should operate or the indications which one must find, and I was unsuccessful in my attempts to gain light upon these points from him. He explained that he had done these operations rather as an experiment and was not certain as to their value. In the analogous operation upon the jugular vein as a complication of otitis media, the site of operation is accessible. We cannot safely reopen the abdomen if things go wrong. Some years ago Dr. James A. Harrar of the Lying-In Hospital staff treated a small series of these cases with magnesium sulphate solution. In this small number, too few to draw definite conclusions from, there was no apparent outstanding benefit from the treatment.

DR. R. R. HUGGINS, PITTSBURGH, PA.—Two years ago I reported a small series of cases of puerperal thrombophlebitis in which we performed ligation of the veins. I tried to make it clear at that time that it was done under stress and where the prognosis was extremely bad, and I also tried to make it clear that it was purely a contribution to that particular kind of surgery and not done with a closed mind.

We have gotten one thing out of this discussion on the operative treatment of thrombophlebitis, namely that we are really beginning to make an effort at diagnosis and these clinical symptoms give us some aid. Occasionally we find a case where there is marked tenderness along the ovarian vein and perhaps tenderness in the broad ligament, as Dr. Williams originally suggested, which aids in making a

diagnosis. It is then up to the surgeon to determine upon the treatment. I fully recognize the fact that the vast majority of these cases are certainly better simply with palliative treatment.

DR. JAMES F. BALDWIN, COLUMBUS, OHIO.—I have never approved of simple ligation in cases of thrombophlebitis. It has seemed to me to be bad surgery to dissect up and ligate the ovarian vein at its entrance into the vena cava or renal vein; but instead of that the vein should be cut across in the pelvis without ligation and allowed to drain into a gauze fluff which passes out through the vagina, the fluff itself being covered by the sigmoid which has been swung around and attached at the brim of the pelvis.

The article which I wrote some years ago on this subject was prepared with the utmost care. I went back over all my records and reported in brief detail 67 consecutive cases of puerperal infection upon which I had operated. In the examination of these infected cases it is bad surgery to manipulate unnecessarily the pelvic tissues, but to remove the uterus with its infected sinuses and let the infected veins drain is in many of these cases a wise procedure. Before completing that article I sent printed copies of what I had prepared to surgeons in Europe and this country who had written upon this subject, including, of course, a number of members of this Association, and without a single exception they all seemed to favor that line of treatment. In that paper I referred to a paper by Dr. C. Jeff Miller of New Orleans, in which he reported a number of cases in which ligation of veins had been made with the saving of about 60 per cent. In my paper I divided, for practical purposes, puerperal infections into five classes, and infected thrombophlebitis was placed with a number of other conditions in class 5, in which class I advised as a general procedure panhysterectomy with vaginal drainage.

Since that paper was published, I have had a number of other cases and with equally satisfactory results. Three of those cases I have had within the past few months.



Cases of puerperal sepsis should have the very best possible attention. These cases should not be left for history-taking and examination to internes or even assistants, but should be cared for by the specialist himself. A careful study of each case, careful weighing of symptoms, a bimanual examination, and of chief importance careful study of the history of the patient, should enable one to make a correct diagnosis. I have never been able to feel those "worm-like masses" mentioned by Dr. Williams, but I have no doubt they occasionally occur. In one case which I reported I found high up back of the cervix a very tender little mass which I thought was a small abscess in the posterior wall of the uterus. At operation I found this abscess but in addition a second abscess higher up that I had not been able to feel. That patient promptly recovered.

DR. POLAK (closing).—I do not believe that we should confuse this question of puerperal infection. Endometritis, perimetritis and thrombophlebitis are distinct pathologic entities. Unfortunately they run into one another and are not so clean cut clinically as the textbook would give us to understand.

I have gone over Dr. Baldwin's cases and am convinced that a large number of them got well. He operated on cases that I, personally, would not have operated upon, and from the symptomatology I do not think Dr. Baldwin can say positively that some of these women would not have gotten well without surgery.

There is a pathologic and a biologic defense in every case of thrombophlebitis which is identical with the defense which we get in a case of endometritis which gets well by drainage and uterine contraction and being let alone. However,

manipulation will disturb thrombophlebitis far more than it will disturb endometritis. Furthermore, when the vessel is blocked, as it is in the majority of instances, ligation does not help.

The Doctor has spoken of hysterectomy. He does a hysterectomy and leaves the veins open and drains the pelvis. Most of the cases he has cited have reached the stage of peritonitis, and he has been doing what any good surgeon would do who had his dexterity.

DR. L. A. CALKINS, University of Virginia, read by invitation a paper on **Factors Governing Blood Loss in the Third Stage of Labor.** (For original article, see page 578, April issue.)

DISCUSSION

DR. A. H. BILL, CLEVELAND, OHIO.—It seems to me that as a general thing excessive loss of blood during the third stage of labor may be seen in two groups of cases: first, those with relaxation of the uterus, failure to contract; second, those with laceration of the cervix. In regard to the latter, for the most part we may say that excessive bleeding or hemorrhage due to laceration of the cervix is seen only in those cases in which the pernicious practice is followed of trying to deliver the child before complete dilatation of the cervix or of performing manual dilatation. It is seldom that unusual loss of blood is seen when the first stage of labor has taken its natural course.

In regard to relaxation, I believe that prolonged second stage of labor, due to some obstruction which may be corrected, such as faulty position, is undoubtedly a cause of excessive bleeding and should be corrected early in the second stage of labor.

There is no question but that anesthesia prevents contraction of the uterus. This is not an argument against anesthetics, but it is an argument for taking unusual precautions where anesthetics are used. I have used anesthetics to the utmost degree but certain precautions have been taken to offset their relaxing effect. We are very careful in head presentations to stop the anesthetic just as soon as the head of the child is born. In cases of version the anesthetic is removed as soon as the feet of the child are brought down because with the complete relaxation needed for version further anesthesia is not needed to finish the delivery. In addition to this I have used routinely for the last twelve or thirteen years the administration of pituitrin immediately following the birth of the child.

In cases of antepartum hemorrhage there is undoubtedly a predisposition to excessive loss of blood in the third stage of labor. I would again suggest the importance of foreseeing this and in such cases fortifying the patient by a prophylactic transfusion.

I cannot agree with those who forbid placing a hand on the fundus during the third stage of labor. I believe it is important to keep a hand on the fundus because it is the only way in which we know whether the uterus is contracted and whether to further stimulate it.

DR. EDWARD SPEIDEL, LOUISVILLE, KY.—I would like to learn from the essayist the exact method used in conducting the third stage of labor, as this is important for an understanding of the figures presented. After having tried all the short cuts for the conduct of the third stage of labor that were ever published I have now returned to a very simple method. After the baby is born I watch the fundus by placing my hand near the umbilicus so as not to interfere with the natural elongation and expulsion of the placenta, as shown by Williams, and then wait twenty minutes by the clock, and in most instances the placenta comes away easily.

I have, of course, tried pituitrin for hastening the third stage of labor, administering it after the birth of the child, and by the time I reached home there would be more hemorrhage and I would have to return to the hospital. In other words, there is a sudden expulsion of the placenta, a sudden retraction of the uterus and then naturally a relaxation following and more hemorrhage. Consequently I have now returned to one of the old methods of conducting this stage and find it very satisfactory.

DR. CALKINS (closing).—Dr. Bill made reference to the long second stage of labor as a factor in blood loss. From my figures I think it is safe to say that that is not an important factor. The second stage may be long or it may be short, and the blood loss is not materially affected.

The anesthetic is a very important factor, for an anesthetic poorly given may do more harm than good. The proper management of the third stage is the most important factor of all.

Dr. Speidel asked what technic we employed. That does not make any difference as far as the paper is concerned. My paper would hold for any technic, consistently used on each and every case. However, it is very simple and is as follows: The anesthetic is stopped as soon as possible. We are careful that the patient gets a considerable quantity of oxygen and let her wake up as soon as possible after the baby is born. We use pituitrin immediately on delivery of the placenta. We keep our hand on the fundus, not at the umbilicus, from the moment the baby is born until we are sure the bleeding has stopped and is not likely to start again.

DR. FRED L. ADAIR, Minneapolis, Minn., (by invitation) read a paper entitled **Infection in the Puerperium, With Analysis of 8000 Cases.** (For original article, see page 559, April issue.)

DISCUSSION

DR. MAGNUS A. TATE, CINCINNATI, OHIO.—Puerperal infection and streptococcal infections are most timely subjects to bring before a society like this, because we are in the dark on so many of their important phases. While we have reduced the incidence to puerperal infection by rigid asepsis, it is apt to occur in our institutions and in certain localities. I think the careful analysis of this situation at Sloane was most important, showing the care taken and the deductions drawn from the study of these cases are valuable. For instance, there was an increased leucocytosis, polymorphonuclears running up to 84, hemoglobin 71 per cent, and it was found that the blood cultures and smears from the vagina showed in many of the cases the *Streptococcus hemolyticus*. They also found at autopsy a violent infection in the abdomen, with much fluid and here and there a rupture of an abscess.

I have thought for many years that there must be some peculiar immunity in many women, in fact in most women, otherwise how can we account for cases that go along receiving much trauma, in labor many hours, and still remain absolutely free from infection?

To those who are doing obstetrics the question of treatment is important. What shall we do in cases of puerperal infection? We have gone through the usual routine of treatment; we use serum with surprising results in a few cases, but in most cases it is rather disappointing. Lately we have been using mercurochrome, and I must say with also disappointing results. Outside of treating our patients symptomatically, I have found that very large doses of quinine have given the best results. In a personal discussion with Dr. Pantzer some years ago he asked me if I had tried salicylate of soda. During the past four years in the cases that I have

seen, especially of the *Streptococcus hemolyticus*, I give the serum first, but I also give forty grains of quinine by mouth and 100 grains of salicylate of soda per rectum and repeat that in half doses in twelve to twenty-four hours; and my results, I believe, justify the continuance of this treatment.

DR. ARTHUR J. SKEEL, CLEVELAND, OHIO.—I believe we have all been satisfied, for the last few years at any rate, that the matter of the introduction of bacteria has had too much stress laid upon it and there has been insufficient attention paid to the study of immunity.

In the study of fever during the puerperium we must first eliminate the non-puerperal infections. A breast abscess is not puerperal infection in the sense that it has anything to do with labor. The abscessed jaw due to an infected tooth has nothing to do with labor, neither has appendicitis occurring in the puerperium.

Our infection rate has dropped strikingly since the adoption of forceps control and free use of episiotomy. A doctor who puts on a pair of sterile gloves, handles the labia and perineum during delivery and then invades the genital tract for repair with the same pair of gloves is guilty of faulty technic.

The free use of episiotomy not only avoids lacerations, but more important still it prevents pressure necrosis. I am convinced that prolonged pressure any place in the genital tract by the hard fetal head produces pressure necrosis and consequent destruction of the local immunity to infection. No matter how good the cervix, vagina and perineum, there are plenty of atria for infections. It is not necessary to have a two inch tear to determine infection. The thing that determines whether there will be infection, granted the presence of pathogenic bacteria, is the amount of pressure necrosis produced during the labor and not the size of the tear.

After eliminating the accidents that may have to do with the conduct of labor and careless technic, we still have left cases about which we have been so much mystified. I want to make two suggestions. I think the study which Dr. Adair suggested of skin immunity, the Dick test, is very important because it includes not only the patients who have had scarlet fever but also those who naturally are immune. A study of the skin reaction would cover both the inherited and acquired immunities of this type. If further study of this subject proves that the relationship exists between scarlet fever and these streptococcic puerperal infections, we should derive therefrom some therapeutic aid. In treating such cases by transfusion, we should select as donors Dick test immunes, with the hope of injecting with the blood whatever it is that gives the donor immunity.

DR. HERBERT M. LITTLE, MONTREAL, CANADA.—I am inclined to agree with Young that trauma is indeed a neglected but most important feature. It is well known that the results of repair after episiotomy are better than were the results of repair of perineum damaged by pressure on an arrested head, and it is not too much to assume that the excellent results reported by DeLee in cases where the second stage of labor is shortened are due not only to the lessened pressure, lessened trauma in the second stage, but also, and this is a most important factor, to prevention of the vitiation of the patient's resistance by fatigue. A patient returned from labor room to ward with a pulse between 70 and 80 has a much better prognosis than one with pulse ranging between 100 and 120.

What are we going to do about it? In the first place there must be a sufficiently definite clinical investigation to determine the nature of the infecting agents, then, so far as the delivery was concerned, how many people were associated in the conduct of the labor; was a forceps applied if so when; how long had the patient been in the second stage? Was the uterus subject to manipulation after rupture of the membranes, with the certainty of smearing organisms in the posterior fornix over those membranes and so allowing them access to the uterine cavity? Most important, what was the conduct of the third stage? Were any attempts made at

expression of the placenta before it evidently completely separated? Another simple question might be, was the perineum repaired during or after the third stage and were swabs placed in the vagina during the repair? Naturally after episiotomies the sutures are laid after the birth of the child before the placenta separated, and the uterus is left severely alone lest resultant hemorrhage make the repair more difficult.

I cannot accept the English view that cases delivered with forceps are more liable to infection than those delivered spontaneously. When the application of forceps is feared or discouraged, the patient eventually subjected to forceps will undergo operation at a time when those two most important factors, fatigue and trauma, are at their maximum. While not advocating in any way the unnecessary use of obstetric forceps, I would like to have the statistics of many of those teachers who, while preaching conservatism, really practice active interference for the relief of pain without fear of infection in the belief that active handling is, in the long run, less dangerous to the mother and to the child than a long, unduly protracted so-called spontaneous labor.

DR. HENRY W. SCHOENECK, SYRACUSE, N. Y.—While it is true that we may find an occasional puerperal infection occurring after a labor unattended by many vaginal examinations or operative interference, it is my belief that the less one interferes with the delivery the less likelihood there will be for the development of a puerperal infection. This observation would seem to be substantiated by a study of morbidity rates in some 500 cases of hospital deliveries. In addition to an aseptic technic practiced, tincture of iodine was used externally at the time of delivery. In these cases the morbidity rate, indicated by a temperature of 100° F. or more, taken by mouth, occurring on two successive days between the second and fourteenth days, increased with the application of forceps; the more difficult the operation (with version, introduction of bags, and with lacerations of the cervix and the perineum), the higher the morbidity.

May I mention here the results obtained by the use of acriflavine in 250 cases. This dye was instilled into the vagina at the time the patient entered the hospital in labor. It was applied externally, also, at the time of delivery. The general morbidity rate was reduced to the figure of 1.7. We found, however, that the morbidity rate here, as in the first series mentioned, was increased by operative interference.

If these observations mean anything at all, they would seem to justify what I said in the beginning, that is, the liability to puerperal infection increases with the practice of interference with the delivery of the patient.

DR. WILLIAM A. SCOTT, TORONTO, ONT.—I quite agree with the remarks of the last two speakers, that as far as the general profession is concerned the hope of reducing the number of cases of fever in the puerperium lies in careful technic and minimum operative interference and that when interference is necessary it be carried out at the proper time. However, in spite of our improvements in technic and the most painstaking care and greatest obstetric skill possible, there still remains a small number of cases.

During the last three years we have been making some investigations here along somewhat the same line, although we started from the standpoint of therapeutics rather than from the standpoint of etiology. In the fatal cases, for all practical purposes, the streptococcus is the organism with which we are concerned. When considering morbidity the infection is often not due to the streptococcus, but when the latter is present it is not the *Streptococcus hemolyticus*. Therefore, we started to take routine smears from the cervix of all patients in the antenatal clinic with the idea of determining how many of these were harboring in their cervixes

the hemolytic streptococcus. Figures have not been published yet, but the number of cases in which the organism was present before confinement was exceedingly small, about 5 or 6 cases.

The next point in our investigation was to determine the sensitiveness of patients to streptococcus by the skin test, and then to check these patients up with their postpartum convalescence. There we encountered some exceedingly interesting results. We have only to progress one step further to reach the stage that Dr. Adair has suggested. It is quite probable that an immunity can be established, such as is established in children for scarlet fever, which is of very short duration, but it will take the patient through her pregnancy and puerperium.

The next step was to attempt what has been tried many times before, to develop a serum, which we did from a hemolytic streptococcus recovered from some of our patients in an unfortunate epidemic that we had. That serum was used first only in cases in which the hemolytic streptococcus was recovered from the blood. We knew the type of case with which we were dealing, and our results were so satisfactory that we then attempted to use the same serum in cases where the patient was seriously ill, where there was no local lesion but where we could not obtain a growth on blood culture, and again our results were satisfactory enough to encourage us. That serum ran out and while we were attempting to produce a new serum we found it was quite like if not identical to the scarlet fever serum. We used the latter and could find no difference in results, so at the present time we are using in these cases a scarlet fever serum, giving 40 c.c. intravenously and 50 c.c. subcutaneously and repeating the dose when necessary only in an intramuscular manner.

We have not advised the use of the serum except where there were facilities for the proper investigation and diagnosis of the case, but we feel that it is of decided value in all cases of puerperal infection due to the streptococcus, whether the infection be a septicemia or not.

DR. A. H. BILL, CLEVELAND, OHIO.—I should like to make a comment upon the question of operative interference which has been brought up. A short time ago Dr. Reycraft, an associate, studied a series of cases from the standpoint of morbidity. One series covered five years, more than ten years ago, when comparatively little operative interference was used and more cases were delivered spontaneously. Then he completed another series covering five years during which period more operative interference was used in the way of early correction of abnormalities of position, low forceps, etc., and he found that the morbidity in these two series was practically identical. In other words, there was no more morbidity during the period when with proper technic more operative work was done than during the period covered by the first series.

In compiling statistics of puerperal infection very little mention is made of the isolation of the obstetric pavilion. Are these statistics taken from separate maternity hospitals or hospitals in which the maternity pavilion is absolutely isolated from the rest of the hospital, or are they taken from the maternity ward of a general hospital in which there is an interchange between the various divisions? I think that has a very decided bearing upon the question of infection.

DR. ADAIR (closing).—Dr. Little brought out an important point with reference to proper technic. The importance of an aseptic technic and of preventing trauma is so well established that it does not warrant any dispute. I am not advocating any laxity in this regard but rather an extension of proper technic or efforts to minimize trauma. The main point I wish to bring out is that in spite of our best care in technic and most careful efforts to minimize trauma we still have considerable trouble with puerperal sepsis and infection with the streptococcus even in our best institutions. This paper is the result of an effort to find out whether or not

we might improve some of these conditions, especially in hospital practice, by increasing the resistance of the patient. In this analysis of cases I was trying to find out whether or not there was any particular difference with reference to the cases with or without scarlet fever, not necessarily with the idea that the streptococcus of scarlet fever was identical with the organisms that are connected with the fatal cases of septicemia but more particularly with the idea that the patients who had had scarlet fever might establish a sort of group immunity to the streptococcal type of organism.

We also carried out some skin sensitization tests to determine whether or not there was less resistance among those who are skin sensitive to the streptococcus. Burt White from similar observation concludes that women who react to this test are more apt to develop infection than others.

We are contemplating carrying out a series of parallel cases in which we will have immunization in one-half of the number and nonimmunization to the streptococcus in the other half in order to see whether or not we can effect the incidence of streptococcal infection.

DR. PAUL TITUS, Pittsburgh, Pa., read a paper entitled **Disturbances in Carbohydrate Metabolism in Toxemia of Pregnancy**. (For original article, see page 553, April issue.)

DISCUSSION

DR. E. D. PLASS, IOWA CITY, IA.—I believe that Dr. Titus' attempt to correlate his ideas of carbohydrate deficiency with the criteria laid down by Williams is excellent. It so happens that practically any theory of eclampsia may be partially correlated with those criteria, but there has not yet been a theory developed that satisfies the criteria in all respects. It is always necessary to slide over some of the very essential facts. For example, Dr. Titus was forced to pass over completely the fact that 75 per cent of the cases occur in primiparous women, since he has no explanation for that fact of incidence. Moreover, he explained the incidence of hydramnios on the basis of the enlarged placenta in that condition. My experience has not been that the placenta is essentially enlarged in the ordinary case of hydramnios. He explains the edema as incident to an acute nephritis. My experience with the pathology of eclampsia is to the effect that there is no acute nephritis. There is a transient cloudy swelling of the kidney cells which cannot be classified pathologically as an acute nephritis. Consequently the explanation of the edema cannot be one of acute nephritis. As a matter of fact, Zangemeister has pointed out a sequence in the development of preeclampsia which it is well to bear in mind. He says that the initial lesion is the edema, that there is a change in the hydrophilic proteins of the body which makes them grasp water and they become hydropic; that secondary to that change there is an increase in blood pressure which is quite essential. If the resistance in the peripheral circulation is increased by a large amount of fluid in the tissues, a hypertension becomes absolutely essential. So far the argument is good. Zangemeister has been able to show that the earliest possible sign that we have clinically of an impending toxemia is increase in weight, in other words edema. Remember that an edema has to amount to something like ten pounds in an average-sized individual before it becomes appreciable clinically, except through weighing of the patient.

Zangemeister then goes on to say that the albuminuria, which is the third stage in the development of the syndrome, is incident to the increased fluid content of the kidney. Dr. Titus emphasizes the fact that milk diet is high in carbohydrate. It is almost impossible to get any patient to take more than 3000 c.c. of milk in

a day. That, with 4 per cent sugar, gives a patient 120 grams of carbohydrate as a maximum. I am sure he would not consider that a sufficient carbohydrate intake in a patient threatened with eclampsia.

DR. OTTO H. SCHWARZ, St. Louis, Mo.—The figures of Dr. Titus regarding the blood sugar values in relation to convulsions of eclampsia, showing that they fluctuate markedly, are very interesting. We have not taken blood sugars in this way and, therefore, are not in a position to speak of his observation. However, I feel that this fluctuation is not necessarily due to a glycogen depletion. It is well known that the glycogen stores of pregnant women are drained more when near term than at any other time. That is due to the fact that the fetus must develop its nutrition chiefly from carbohydrates of the maternal blood. Real depletion of glycogen is accompanied by marked fatty infiltration of the liver. I do not believe that autopsy study shows that the liver of eclampsia is associated with marked glycogen depletion. Early vomiting of pregnancy has usually associated with it a marked ketosis and glycogen depletion. In extreme cases the liver at autopsy always shows at least a marked fatty infiltration. As an illustration of the marked demand on the glycogen stores in pregnancy, I reported studies on a case of hyperthyroidism in pregnancy about two years ago. In this case after ingestion of sugar the blood sugar, after the initial rise, would drop down as low as 0.05 per cent. This does not occur, so far as I know, in ordinary hyperthyroidism or in pregnancy alone, but the combination of the two conditions brings about marked depletion of the glycogen stores. It is assumed in this case that the insulin of the pancreas was stimulated by the ingestion of sugar and was produced in greater amount than necessary for the handling of the carbohydrate available.

DR. TITUS (closing).—The likelihood of eclampsia occurring more often in primiparae than in multiparae is apparent for at least one very good reason. There are far more primiparae than multiparae in the world because every woman who has a child must once be a primipara but not every other mother becomes a multipara. Moreover, if a woman once adapts herself to the demands of a pregnancy, she ought to be able more readily to do so again; the first trial might be expected to be the crucial test. I purposely avoided discussing this, however, because it is so easy to use the same statistics for opposing arguments.

If Dr. Plass thinks I was explaining the edema of eclampsia as being due to acute nephritis, he misunderstood me. What I said was that in any nephritis, edema is now considered to be a protective measure. Therefore, its presence in eclampsia might logically be expected to afford us a more favorable prognosis.

Nor was it I who said that a milk diet was beneficial. That was Dr. Williams. I merely explained why it was not harmful.

In connection with Dr. Schwarz's comments I have some significant findings to offer. We have a study of preeclampsies now under way in our hospital which shows low blood sugar readings to be a frequent occurrence. In one recent case the report on the blood sugar was too low to read. Dr. Hofbauer has shown that there is a relationship between glycogen depletion of the liver and the extent of any liver lesions in pregnancy.

DR. J. C. LITZENBERG, Minneapolis, Minn., read a paper on **The Relation of Metabolism to Gestation**. (For original article, see page 550, April issue.)

DISCUSSION

DR. PAUL TITUS, PITTSBURGH, PA.—I am inclined to favor the views of Dr. Litzenberg over those expressed by Dr. Speidel in his discussion. It would seem

reasonable to think of obesity and endocrine disturbance as being closely related or interdependent. Would we not expect increase in weight to have a background of lowered metabolism? Dr. Litzenberg has considered this subject in the broadest sense, in that he has discussed sterility as including both infertility and repeated abortions.

DR. F. S. WETHERELL, SYRACUSE, N. Y.—For a long time I have been following a case to which I would like to call attention and of which I spoke before this Association several years ago, at which time I was adjudged to have some serious flights of fancy. In 1915 I was consulted by a young man, who was very anxious that his wife should have a child. This young man had, in the two years previous to seeing me, become quite obese. We were not doing basal metabolic rates at that time. Dr. Lespinasse of Chicago had mentioned the use of thyroid extract for the purpose of affecting the spermatozoa. Having found this patient's spermatozoa immobile, entirely empirically I gave him some thyroid extract. About four months after that he asked me to examine a young woman whom he had picked up in his car and who was accusing him of being the father of her unborn child. On examination of the man's spermatozoa they were found to be very active and numerous. Two years later this young man reported that they had a very nice baby a year and a half old at home. It might be very interesting in these cases when studying the spermatozoa also to make a study of the metabolic rates and to administer thyroid extract not only to the woman but also to the man in the event that he is the offending party.

DR. WILLIAM A. COVENTRY, DULUTH, MINN.—I would like to ask Dr. Litzenberg if these cases are followed up after giving the thyroid treatment, if examination is made at a later period to see whether the rate has been increased? We went through a series of follow-ups in thyroidectomies and found that in the cases of hypothyroidism with less than minus ten we were not able to increase that rate by giving thyroid tablets.

DR. GORDON K. DICKINSON, JERSEY CITY, N. J.—I should like to ask Dr. Litzenberg whether he thinks there is any relation between the thyroid condition and the sterility?

DR. W. R. COOKE, GALVESTON, TEXAS.—While I have not the actual figures with me in a much smaller series of cases, Dr. Litzenberg's findings have been borne out in my own work. We have had a number of cases in which sterility was apparently relieved by giving patients thyroid extract, and these patients usually showed a low metabolic rate.

In regard to the abortions, I am inclined to think that hyperthyroidism is more often a cause of abortion than we have thought. I have had four cases of abortion in patients who had never been able to carry the pregnancy beyond the given time who were relieved by thyroid treatment. One was not entirely relieved, but she was carried past the point at which she usually miscarried; treatment was stopped, and she aborted within another month or two.

I am inclined to think this condition is due to some specific reaction between the thyroid and ovary and not to the abnormal metabolism per se.

DR. LITZENBERG (closing).—It has been said that no man has a right to interpret research work unless he is skeptical. I have tried in every way to disprove rather than to prove our work but the conclusion is forced upon us that our results demand that a basal metabolism of sterile women be taken, that it also be taken on all women who abort. The metabolic rate will be an indication of some condition behind it such as hyperthyroidism. Just what the relation is between the

thyroid and ovary we do not know, but we do know that there is some relation. We should investigate the other conditions which may reduce the basal metabolism, such as starvation, overwork, etc.

One of my first cases in this work was a woman who was a teacher, who married a professor and who was a research worker herself, hence greatly interested in our studies scientifically as well as personally. She had been married she thought too long without having children. She was apparently in perfect health, but I insisted upon her having a complete physical examination. A low basal metabolic rate was found. These women with a moderately low basal metabolic rate are usually apparently in a state of good health; it is only the reproductive cells that are affected. She was given thyroid, her basal metabolic rate restored to normal, and she conceived in a short time. I thought this was a coincidence, but two years later she desired another baby and, her basal metabolic rate being minus 18, she was put on the treatment and promptly conceived again. The third time she came in pregnant without treatment. She asked if iodized salt on her table would have anything to do with her condition. Her basal metabolic rate was normal at this time. Upon taking the iodized salt away from her table the metabolic rate went down to below normal within four weeks. Subsequently she conceived again after restoration of her metabolism to normal.

DR. PALMER FINDLEY, Omaha, Nebraska, read the president's annual address: **The Teaching of Obstetrics.** (For original article see 16: 611, November, 1928.)

DR. F. H. FALLS, Chicago, Ill., read a paper on **Hyperthyroidism Complicating Pregnancy.** (For original article, see page 536, April issue.)

DISCUSSION

DR. ROBERT D. MUSSEY, ROCHESTER, MINN.—Dr. Falls's paper is especially timely because disease of the thyroid gland seems to be gradually increasing, particularly where it is endemic, as in the Great Lakes region and along the West Coast. Hyperthyroidism lowers the incidence of pregnancy about 25 per cent. Exophthalmic goiter or hyperthyroidism in adenomatous goiter rarely develops during pregnancy. In the Mayo Clinic approximately 70 pregnant women have been observed with hyperthyroidism, due to either exophthalmic goiter or adenomatous goiter. The course of the disease of the thyroid gland was not greatly influenced by pregnancy nor were the complications of pregnancy greatly increased by the disease. The incidence of miscarriages was not high (about 6 per cent), and the frequency seemed to be the same whether the patient was treated surgically or by expectant measures.

Dr. Falls mentioned that it was not wise to use iodine indiscriminately during pregnancy. There has been a tendency toward the use of iodine in all pregnancies. In certain cases it may be of value in preventing the development of colloid goiter and in the treatment of hyperthyroidism. However, in the presence of thyroid enlargement it must be used with care, especially if the patients are more than twenty-five years old and may have nonpalpable adenomas within a colloid goiter. There is evidence to suggest that iodine may cause adenomas to hyperfunctionate.

The treatment of hyperthyroidism during pregnancy in the Mayo Clinic differs a little from that outlined by Dr. Falls. The use of compound solution of iodine should be of benefit in all mild cases of exophthalmic goiter complicating pregnancy; but its use, except for a short period of time, is contraindicated in adenomatous goiter with hyperthyroidism. If hyperthyroidism is severe and associated

with marked loss of weight and a high metabolic rate, we believe it is better to control the condition temporarily by the use of compound solution of iodine in the preparation of the patient for partial thyroidectomy. One may be treading on dangerous ground in trying to tide the patient over until the termination of pregnancy. If the patient is near term or if the condition is mild, she may be carried through until after confinement. If patients are operated on during pregnancy, they need not remain in the hospital during the remainder of pregnancy as they will be greatly improved and can be carried through to the normal termination of pregnancy. Eight to ten drops of compound solution of iodine are given daily following the operation.

In reviewing the literature one finds a number of reports of cases in which it has been thought necessary to interrupt pregnancy for the relief of hyperthyroidism. I have not found this necessary; in fact, any operation performed on the patient in the exophthalmic stage is likely to cause a crisis of the hyperthyroidism. Therapeutic abortion is a dangerous operation, I believe it is better to control the condition by the use of compound solution of iodine and perform partial thyroidectomy later if it is considered necessary.

DR. E. P. SLOAN, BLOOMINGTON, ILL.—Our experience has been a little different from that of the previous speaker. We have seen 152 cases of goiter complicating pregnancy in the later stages that were treated medically without operation. Of that number 19 died and I think the majority of the others sustained some definite cardiac damage. During the same period of time 396 goiter operations were performed on patients who were pregnant. Only 42 of these were typical exophthalmic goiters and of those 42 about 20 had been married a considerable length of time and became pregnant just after the thyrotoxic symptoms developed. There were 352 cases of adenoma; 29 of these were toxic adenomas in which the symptoms of the toxemia were similar to those of Graves' disease. One type of toxemia in toxic adenoma is the result of hyperplasia in different areas of the gland outside the adenoma. This type differs in no wise in course and symptoms, and its response to iodine is the same as that in typical exophthalmic goiter. In Europe this kind of toxic adenoma is called secondary Basedow's disease.

The other kind of toxic adenoma is the result of absorption of degenerated products from a broken down or degenerated area within the adenoma. Of the latter type there were 152. Symptoms of this variety of toxemia are quite similar to that of an anaphylactic reaction from absorption of foreign proteid. This type of toxemia probably occurs a little oftener in the late months of pregnancy; 64 of these had a minus basal metabolism.

The metabolic rate is always higher during pregnancy. The terms plus and minus are misleading. The normal amount of oxygen consumption for that particular patient should be determined and called 100. The amount actually consumed should be stated in decimals of that norm. Thus minus 10 should be called 90; 20 plus should be called 120. To the other considerations that are used in arriving at the normal standard, or 100, should be added the stage of pregnancy. I am not aware of any one having worked out the normal rise of metabolism for each month of pregnancy.

There were 173 nontoxic cases operated upon for relief from pressure symptoms, and 161 of the 173 had shown rapid growth since pregnancy occurred. In 109 there were severe cardiac disturbances. Forty-six had intrathoracic goiter.

Of 152 toxic adenoma cases with toxemia from absorption of degenerative products of the broken down adenomas there were 38 definite cases that the condition was so severe that they were emergencies. There were no abortions and no deaths in any of these 396 operated cases.

It seems to us that the indication for operation rests not so much on the degree of thyrotoxicosis as it does upon the condition of the heart and circulatory system.

The pregnant woman with goiter sometimes dies from the effects of the cardiac disturbance, and the reason for operation is relief from a cardiac disturbance that nearly always becomes progressively worse during the course of the pregnancy. The patient who has a toxic goiter and goes through a pregnancy, rarely if ever has as good a circulatory mechanism as she had before.

We believe that every real goiter case seen before the fourth month should be operated upon unless there are strong contraindications. From the fourth to the sixth month strong indications are required to justify operation. From the sixth to the ninth month operation should be done only in dire emergency.

DR. WILLIAM A. COVENTRY, DULUTH, MINN.—I come from a goiter belt also, and our experience has been that quite a number of cases show symptoms very suggestive of toxic goiter during the first two or three months of pregnancy. If the surgeon happens to see the case before the obstetrician does, he is sorely tempted to operate because the symptoms simulate very closely those of a toxic goiter. Fortunately the obstetrician usually sees these patients also and stops the operation because most of these patients in our experience have been young women who have married, kept on with the work that they were pursuing before marriage, planning to save money to buy a home, and were not quite prepared to have a baby at this time. Upon finding that they are pregnant, they immediately go into a chain of symptoms that simulate very closely those of a toxic goiter. They may even have an increase in their metabolic rate.

We have not operated on patients who present symptoms of toxic goiter during the first three months. We have noticed that if we get them to the third month, and institute the Forsheim method of treatment they get along very well after the third month and usually no medical treatment is necessary.

DR. FALLS (closing).—The treatment by operation or by medical management it seems to me depends somewhat on the degree of intoxication. I believe, as Dr. Coventry has said, that in the early months of pregnancy when thyroid symptoms are marked the surgeon who sees these cases would be tempted to operate upon them. We have had four such patients, none of whom were operated upon. They went through their pregnancies to term and delivered normally. One was invalided and was kept in bed during the last half of the pregnancy. I do not know how severe the thyroid symptoms would have become if we had not kept her in bed. She did not show any tendency to abort and one of her babies is living and normal. The other twin would be the same except an accidental cerebral hemorrhage was acquired during delivery. The fact remains, however, that when these cases are treated surgically they do abort. Both in the Mayo series and Percy-Seed series some of the fetuses were aborted following operation on the thyroid. My series is too small to draw any definite conclusions, although it would seem that since there were no abortions and the mothers all did well that medical management should be given proper recognition in the treatment of those cases.

One purpose of this paper is to encourage the accumulation of more statistics along this line.

The normal basal metabolic rate has been found to be increased in pregnancy; a plus or minus 10 is given as the limits of normality for nonpregnant individuals. During pregnancy the rate increases to plus or minus 20. I have felt that anything under 30 might be considered normal. However, if the reading is found to be above 30 we should consider that a pathologically increased rate.

We found no glycosuria although we were on the lookout for it. I do not know why. It seemed probable that we should encounter glycosuria along with other evidences of disturbance of the thyroid function. It may be that our series was too small to have included this complication.

DR. A. M. MENDENHALL, Indianapolis, Ind., read a paper entitled **The Teaching of Operative Obstetrics.** (For original article, see page 583, April issue.)

DISCUSSION

DR. JOHN O. POLAK, BROOKLYN, N. Y.—This paper is of interest to me because Dr. Mendenhall has taken the position I have always opposed. I do not believe we are justified in teaching operative surgery to the undergraduate, neither are we justified in teaching operative obstetrics beyond a certain point. At the Long Island Medical School we have, by cajoling and flattering our physiologist into the belief that there is such a thing as physiologic obstetrics, succeeded in getting the third trimester of the sophomore year for the physiology of obstetrics. This time is entirely devoted to manikin instruction in diagnosis and the physiology of pregnancy and the mechanism of labor as we believe it should be taught so far as one basic principle is concerned, namely, that nature is competent normally to effect delivery and that there is no operative procedure justifiable until the passages are thoroughly opened by the physiologic processes. We have insisted upon that and have finally gotten some results.

In the third year our students have a manikin course given on the method of version, breech extraction and the application of forceps. That is where I believe the limit should be. I believe every graduate should be trained in doing version and in low forceps and in breech extraction. There is no such thing as high forceps operation. The slogan "Don't pull, you guide, she pushes," is basic in breech extraction.

The next important point is that the usual hospital residence of four weeks for the undergraduate is altogether too short a time, for he should have eight weeks, or the same time allotted to surgery. We can only accommodate our men for four weeks' residence in obstetrics. They work in the outpatient and prenatal clinics, which gives them opportunity for diagnosis, the recognition of contracted pelvis, and dystocia. We try to impress upon them that when there is a condition of dystocia they must have help, or if they have not help they must depend upon their own resources. Although our men are getting from 20 to 70 cases, we feel that they are going out incompetent if we compare their training to the midwife training that is given in Europe where the midwife delivers a minimum of 200 cases. The most we can do is to give them a thorough manikin training, perhaps one low forceps application under guidance, and a relatively long training in diagnosis and indications. My personal feeling is that no man is competent to do obstetrics outside of low forceps and breech extraction who has not had a hospital residence. An interne training of three months or six months is too short. It is only at the end of a year that our men actually recognize conditions and show good judgment, and that is the reason we have established a four years' residency. It is unfortunate that the majority of these young men would rather starve in the city than go into the country districts. The only thing that teachers of obstetrics can do, as far as I can see, is to teach these men the physiology of labor, to recognize the cervix when it is dilated and never under any circumstances to apply forceps or do a breech extraction until it is absolutely necessary.

DR. L. A. CALKINS, CHARLOTTESVILLE, VA.—I am going to reiterate some of the things that Dr. Polak has just said, perhaps in a little different way. My idea of teaching obstetrics has been that if we emphasize the physiology of obstetrics we have done the best we can do for our undergraduates; on the pathologic side, if we teach them the indications, and more particularly the contraindications for operation, that is about as far as we can go. If we attempt to give more operative obstetrics than breech presentation, forceps, and version, we will put in the mind of

the student an undue emphasis on the operative side, something which we have all been trying to avoid. I believe in our limited curriculum we will have to be satisfied with this small amount of operative teaching.

Dr. Polak said there was no such thing as a high forceps operation. Perhaps there is not in Brooklyn, but there is south of the Mason-Dixon Line, and we have considerable difficulty in impressing upon our students that it is a relic of the dark ages.

DR. M. P. RUCKER, RICHMOND, VA.—What Dr. Mendenhall and Dr. Polak have said is entirely true from the standpoint that we cannot in our teaching of obstetrics tell students exactly what to do in any given case. They may know what to do generally but when confronted with the particular patient they have not sufficient judgment. The mechanism of labor and later on the use of forceps can be taught on the manikin, but that does not equip the student to apply forceps on the patient.

I would like to see one or two things done. We must teach the public that an M.D. degree does not qualify a man to practice obstetrics, or we must give our graduates some further instruction in obstetrics, not necessarily operative obstetrics, but clinical instruction so that they will recognize these cases of dystocia without having to look in a textbook to memorize how to control them. It is rather useless to turn a man out of the medical school with a lot of rules in the back of his head who will not know when he looks at a patient what her condition is. I think the important thing is to agree before we consent to graduate a man that he shall be given a practical examination so that he will know when the cervix is dilated.

DR. WILLIAM T. MCCONNELL, LOUISVILLE, KY. (guest).—The subject of obstetrics has been held on such a low plane by both the laity and the profession that the recent graduate is expected to be able to do all ordinary obstetric operations. It seems to me that under these circumstances it is difficult for him to refuse to do these operations, and so he does them with the result that the gynecologic surgeon reaps a rich harvest later from these patients. Therefore, it devolves upon us who are teaching this subject to impress upon these students very profoundly that operative obstetrics is a serious and a difficult procedure, that it should not be undertaken by men who are not equipped to do this work.

I, personally, am glad to notice that in our section of the country operative obstetrics is coming more and more to be considered a surgical proposition. It is very difficult for men with the training that we now give to become proficient in forceps operations. They can see the operation and yet not know how to do it because we are working in a hidden field. The only way to become skillful is to do the operation under supervision.

DR. JAMES E. DAVIS, ANN ARBOR, MICH.—One side of this subject has not been sufficiently emphasized, namely that there is a problem here in pedagogical economics. When one looks at the different curricula of Class A schools one finds there are unnecessary repetitions in different subjects; one teacher repeats what another one has taught or could teach better. One finds in almost all schools that there is seldom a dean who will take the time and trouble to go about through the different departments of his school to learn where economy of time might be secured. Attention was called in one of the letters quoted by Dr. Findley to the fact that too much time was given to pathology. All are aware that the pathologist can and should teach much of the pathology of obstetrics. It does not follow that the pathologist fulfils this duty, but I do not see how one who is teaching general pathology should escape from giving a great deal of attention to the pathology of obstetrics. Neither should the teacher of physiology escape from giving a great deal of attention to the physiology of obstetrics. It seems to me that before we

secure an adequate remedy for what we have been talking about at great length this problem must be directed to the deans of the schools in order to get a proper adjustment of the attention to be given by the different teaching members of the faculty. If that is properly done the problem resolves itself into one of a sufficient number of hours for clinical attention to the subject.

There are so many hospitals where the obstetric service is very large. In Detroit we have no less than three hospitals with over 100 obstetric cases per month, sufficient to give each student more than 100 cases in a short period of time.

DR. A. J. RÓNGY, NEW YORK CITY.—We were told by Dr. Sadlier yesterday that in New York one out of 171 women die as a result of childbirth. I have discussed this problem for many years, and it seems to me that the solution does not lie entirely in the teaching of obstetrics in undergraduate schools. No matter how much we teach these men we will not make obstetricians of them. I think the fault lies chiefly in the hospital system in this country. I am at present engaged in helping to draw up plans for a new hospital. When I made a plea for a larger obstetric service, I had difficulty in convincing the board of managers that the obstetric department is as important as the medical or surgical. I was finally able to influence them to give at least 20 per cent of the hospital beds to the obstetric service. When we realize that most of the large hospitals throughout the country afford no opportunity for their intern staffs to be trained in practical obstetrics, we possibly can account for the incompetency that prevails in this branch of medicine. I think this Association should undertake a campaign of education for the establishment of an obstetric department in every large hospital, so that the young physicians may be better trained in this field of work. In that way the morbidity and mortality associated with childbirth will be reduced to a large extent. I believe we should urge the American Hospital Association to take up this important question.

DR. MENDENHALL (closing).—I believe the only difference between Dr. Polak and myself is the question of inflection. His opening remarks would seem to indicate that we were differing in our opinions upon this subject, but we are not. I am happy to say that I have followed Dr. Polak's methods for a great many years and have planned my own accordingly. I would like to read the last sentence of my paper: "Shall we continue this unsatisfactory training, or shall we avoid all attempt at teaching major obstetric surgery to the undergraduate and compel him to obtain this training later?" I am reminded very much of my last lecture by Dr. deSchweinitz. He said "You are not ophthalmologists. I hope I have taught you a little ophthalmology and a little diagnosis." I feel that in obstetrics we are allowing our students to go out and do obstetric surgery whether they are properly trained or not. I agree with Dr. Polak absolutely. Under our present conditions we had better ignore the teaching of operative obstetrics entirely unless we can teach it more thoroughly and more completely than we are now doing. In Indiana we are making comparatively little effort to teach operative obstetrics.

Dr. Polak said that students have little opportunity to do a forceps delivery. That is true in many schools of America. We have not done the high forceps operation in the University of Indiana for eight years.

Economy of time was mentioned. All the departments want more time, of course. It is our duty to impress upon the deans of our schools the relative importance of obstetrics. Dr. Davis' remarks might be somewhat misleading. He spoke of the opportunity of students to *see* 150 cases of obstetrics per month. That is what I am talking against, for *seeing* these cases does not make the student an obstetrician. We can *show* them plenty of cases but they do not have the opportunity to take care of the work themselves.

DR. JAMES K. QUIGLEY, ROCHESTER, N. Y., read a paper entitled **A Study of 165 Consecutive Cesarean Sections Including a Comparison Between 104 Classical Operations and 61 Laparotrachelotomies.** (For original article, see page 597, April issue.)

DISCUSSION

DR. LOUIS E. PHANEUF, BOSTON, MASS.—I have personally performed 306 cervical cesarean sections, including 220 with the longitudinal incision, and 86 with transverse incision. In this group 119 operations were performed on 50 women or 69 repeated cervical sections as follows: 37 women had two operations; 8 had three operations; 4 had four operations; and one had five operations.

The repeated cervical cesarean sections followed the longitudinal incision in 67 cases and the transverse incision in 2 cases. In addition a low classical cesarean section was performed on a woman who had had four previous cervical cesareans, the first three with longitudinal incision and the fourth with a transverse incision.

All the cervical scars were found perfectly healed with the exception of two. In the first a previous cervical cesarean section with a longitudinal incision had been performed; at the time of the second operation she had been in labor eleven hours, and a weak spot was found in the upper part of the scar where the previous incision had encroached upon the body of the uterus; that portion of the incision which had been placed in the cervix was perfectly healed.

In the case of the second patient four cervical cesarean sections had been performed, the first three with the longitudinal incision and the fourth with a transverse incision; at the fifth operation, which was done at the appointed time, without labor, a thinned-out scar was found, so that the bladder was not separated and a low classical section was performed.

In the few weak scars reported the weak spot was found in the part of the incision which was in the body. I thought sometime ago that if the scar were placed entirely within the cervix better results might be obtained. For this reason I have used a transverse cervical incision in my last 86 cases. It is too early to say what the future of this scar may be, but it is possible that by placing the scar entirely in the cervix and preventing encroachment upon the body better results, as far as rupture is concerned, may be obtained.

DR. WILLIAM A. SCOTT, TORONTO, ONT.—For the last four years I have used the low section exclusively. During that time the only classical section that I have done was upon a patient with an acute pulmonary edema where the patient had to be put in a nearly upright position in order to administer the anesthetic. My cases during that time, numbering about 50, have included at least a half dozen patients upon whom I would not have dared do the old classical section, and I would undoubtedly have sacrificed most if not all of the babies without the low section. The first great advantage of this operation is the fact that it increases the operability. That is proved by the fact that in these cases mentioned a classical section would have been contraindicated. Three of these patients subsequently developed pelvic infection in the cellular tissue and had extraperitoneal collections of pus evacuated through the anterior fornix. I feel certain that if they had had a classical section instead of an extraperitoneal infection they would have had an intraperitoneal infection which would most likely have been fatal.

A point in the technic that the previous speaker touched upon is exceedingly important. If we are going to do a low section, it should be a low section and not one that is half and half. So frequently one sees illustrations of a so-called low section in which the incision is deliberately extended above the limit of the true low section. It extends up into the body of the uterus. The patient must be in a

Trendelenberg position to some extent, and I think the incision should never extend above the natural attachment of the bladder. That means that the incision will be carried well down behind the pubes and that the extraction of the child is somewhat more difficult.

The great advantage of making the incision at such a low level is the fact that when one comes to close it after closing the incision in the uterine wall, which is exceedingly thin, one finds a very definite layer of fascia which can be closed as a separate layer. As one goes above that area this fascia disappears, and attempts to bring another layer over means that one is simply using the wall of the uterus. This fascia is one of the most essential factors in holding the infection and helping to keep it extraperitoneal. If the infection goes through the stitch-holes that have closed the uterine wall, then it is further retarded by this dense layer of fascia. I also feel that in that particular area one gets a better healed scar than if the incision is run up somewhat higher. I think it makes very little difference whether the incision is transverse or longitudinal as long as it is kept at that low level.

I might say that in this series of cases there has not been a death, in spite of the fact that in some the classical section would have been contraindicated.

DR. IRVING POTTER, BUFFALO, N. Y.—I cannot say anything about the low section because I have only done it a half dozen times. I have had to do the high section following the low section done by others a number of times, and I have not been pleased with the findings in those cases. My experience with cesarean section covers a series of over 1500 cases personally performed. Those have mostly been high sections, I mean by that, above the umbilicus. There were not many where the incision was partly below the umbilicus.

I feel that we have been too much afraid of the so-called potentially infected uterus or the so-called potentially infected case, and I am not so sure that this low two flap operation is such an easy thing to do. Reports come to me from various men who have done a number of these cases bearing the history of experienced operators working for from 1 to 1½ hours to stop the bleeding. To my mind that is not an operation of choice. A woman who is potentially infected should not be on the table an hour and a half to have hemorrhage stopped which can be avoided at the high operation by packing the uterus from above. I do that routinely now, although formerly only in the placenta previa cases; I now pack it with a strip of 10 per cent iodoform gauze of three or four thicknesses 3 fingers in width and 15 inches long, and leave it in the uterus, not pushing it through the cervix but putting it down in the lower uterine portion and closing the incision. The gauze is removed through the vagina during the second day. That insures complete drainage of these so-called potentially infected cases. It also establishes a leucocytic wall which is of great value. We close the uterus with 2 continuous sutures in the muscle and one in the uterine peritoneum and then put pituitrin in the body of the uterus and a pint of a 5 per cent solution of glucose into the peritoneal cavity. Before the patient is out of the anesthetic she is given 500 c.c. of 5 per cent glucose solution under the breast.

I have a maternal mortality of less than 2 per cent that covers a series of clean and of infected cases. There is a maternal mortality in everything connected with obstetrics.

So far as the rupture of the scar is concerned I have a series of 15 cases that followed the high operation, with one death.

I have done a number of high operations following the low section which had been done by other operators and found very extensive adhesions. Adhesions of the omentum sometimes follow the high operation but they are not bad. Another thing, with a high operation the abdomen can be explored, the uterus looked at, and I think the danger is not so great, the loss of blood is less and the results are good.

DR. A. J. RONGY, NEW YORK, N. Y.—Ten or twelve years ago we became excited about extraperitoneal cesarean section, and it was considered an ideal operation for infected cases. I then said that 90 per cent of extraperitoneal operations became intraperitoneal before the operation was completed, and I refused to perform it. Now we have the cervical operation, and I daresay that five or ten years from now we will not hear a word about it. The cervical operation is done in supposedly infected cases upon women who have been in labor and are exhausted, or upon those on whom an attempt at delivery by forceps has been made. Instead of doing a quick operation, which takes from fifteen to twenty minutes, the so-called classical operation, we subject the patient to an operation that takes at least three times as long. In addition we create a wound area by separating the peritoneum above and below, and if there are any bacteria, they have a place where they can develop.

I have never performed a low cervical cesarean section, but I have watched it done by many competent men. It took them three times as long to do it as it would have taken to do the classical cesarean section; the bleeding was greater, and the patient was not in as good a condition after the operation.

In a badly infected case I put a drain in the lower angle of the wound as I would drain any infected condition.

DR. JOHN OSBORN POLAK, BROOKLYN, N. Y.—I wish to call attention to a suggestion of Dr. Potter's of placing gauze in the uterus. I disagree with him as to how it acts. Placing of gauze in the uterus stimulates contraction and develops better protection in the basal endometrium. It does not drain the uterus after the first few hours but acts as a tampon. I have seen it left in for six weeks although it usually comes out spontaneously in twenty-four hours.

The other point is in regard to the incision in the uterus. Dr. Phaneuf would lead us to suppose that the transverse incision was the one of choice. The transverse incision is to be applied particularly to the patient who has been in labor, a long time not in the elective case. Most of us are doing low sections on our elective cases for the reason that there is a definitely lower mortality, irrespective of Dr. Potter's statement. In 1800 cases collected in Brooklyn the mortality following classical section ran from 3 per cent to 9 per cent in the elective cases, 6 to 14 per cent after the membranes were ruptured and manipulation had occurred. In that same city the mortality in the low section, done by many operators, ran down to 1 per cent. There is no question that there is some advantage in the low section, and while the technic is condemned by those who have not tried it, it is not a difficult technic.

DR. JAMES W. KENNEDY, PHILADELPHIA, PA.—Regarding cesarean section in the infected uterus, we have never endorsed any of the flap splitting operations. We take the position that in the infected uterus, which is a true wound infection, the patient does not receive the final dose of toxins from the peritonitis but from the continued infection as a retroperitoneal one. Therefore we do not approve the flap splitting or extraperitoneal procedure which necessitates opening up and exposing the retroperitoneal space. This is rich in absorbents and has no protective elements such as the peritoneum has.

In other words, I would rather have pus on the peritoneal surface than I would in the retroperitoneal space. We will come into our own when we realize that the peritonitis is not most often the cause of final and fatal dose of toxins from intra-abdominal infections. We do the simple classical cesarean section, as this has the fewest units of trauma and can be done most quickly. I feel that the low incision is all right in the infected uterus as the body of the uterus or cervix is not so thick at such location and is the proper position for suture drainage.

We use through and through sutures, silk in the uterus and through and through sutures in the abdominal wall, as these have many advantages from the standpoint of drainage.

DR. QUIGLEY (closing).—I should not discuss the transverse incision because I have never done one, but it occurs to me that there would be more hemorrhage laterally. As to the question of leaving gauze in the uterus, I regard it as a pack rather than a drain. I have not seen the increased hemorrhage spoken of. I have had but 63 cases, but other men who have done this operation upon large series of cases have not reported increased hemorrhage. If this condition follows the operation, I think poor technic is at fault. Also if it takes an hour and a half to do the operation, that operator has no business to do it. I cannot do a classical section in ten minutes, but think I have done well to do it in eighteen or twenty minutes. I believe thirty minutes should be the limit. In the cases of peritonitis following the classical section I think the trouble is seepage through the wound that is not protected.

I have seen adhesions in a few cases, but I do not find as many as following classical section. I have had no difficulty in making two flaps in a subsequent operation.

DR. CHARLES W. MOOTS, Toledo, Ohio, read a paper entitled **Importance of Urography in the Interpretation of All Obscure Abdominal and Pelvic Cases**. (For original article, see the current volume of the Transactions of the Association.)

Symposium on Radiotherapy in Pelvic Disorders

DR. P. BROOKE BLAND, Philadelphia, Pa., read a paper on **Pyometra Following Radium Therapy for Uterine Cancer**. (For original article, see page 528, April issue.)

DR. PERCY W. TOOMBS, Memphis, Tenn., read a paper on **The Effects of X-ray and Radium Upon the Fetus in Utero**. (For original article, see page 516, April issue.)

DR. W. T. DANNREUTHER, New York, N. Y., read a paper on **Radiotherapy in the Treatment of Cancer of the Cervix**. (For original article, see page 524, April issue.)

DR. R. D. MUSSEY, Rochester, Minn., read a paper on **Radium in the Treatment of Menorrhagia of Adolescence and of the Menopause**. (For original article, see page 502, April issue.)

DR. F. A. CLELAND, Toronto, Canada, read a paper entitled **The Radium Treatment of Fibroids and Fibrosis Uteri**. (For original article, see page 508, April issue.)

DISCUSSION

DR. LEDA J. STACEY, ROCHESTER, MINN.—In a study of another group of married women during the child-bearing period, I found that 11 had become pregnant subsequent to the application of radium. There were in this group 10 normal living children, 5 stillbirths and 2 miscarriages. With the exception of one patient who received 615 mg. hours of radium and who gave birth later to two normal children, these patients received an average dose of 320 mg. hours of radium. In using radium in young girls one must always keep in mind the conservation of the ovarian function and give only the small dose, not more than 300

mg. hours. In older women sufficient time should elapse before radium is repeated if the results following the first treatment are not satisfactory. The full effect of radium is often not obtained under three months' time. Dr. Cleland has reviewed the contraindications to the use of radium, and I should like to add one other, that is the presence of submucous fibromyomas, as I believe most of our failures have been in those cases. In 1922 I reported 3 cases of carcinoma of the fundus occurring in a group of 1013 patients having received radium for benign conditions, and there has been one since that report was made. Therefore, if irregular bleeding recurs after the radium, carcinoma must be considered as a possible cause, and I believe it safer to remove the uterus unless there is a definite contraindication to surgery rather than to depend upon a curettage for diagnosis and a repetition of radium treatment.

Dr. Bland has called attention to pyometra following the treatment of carcinoma of the cervix with radium. We have observed this complication in the Mayo Clinic in only a few cases, and I believe it can be avoided in most cases by making one or two applications into the body of the uterus during the course of radium treatments.

DR. S. E. TRACY, PHILADELPHIA, PA.—As pointed out by Dr. Bland, a certain percentage (about one per cent) of patients with carcinoma of the uterus treated with radium will develop a pyometrium. The proper treatment for this complication is prompt and efficient drainage whenever possible; in some cases, however, hysterectomy will be necessary. Those who have had experience with radium are agreed that it is the best treatment for bleeding in fibrosis uteri. Simple uncomplicated fibromyomas of the uteri in women past the age of forty years can in a large percentage of cases be satisfactorily treated with radium. The proper selection of cases is a matter of diagnosis. The more expert the diagnostician the smaller will be the percentage of cases selected for this method of treatment, the better will be the results and the fewer the failures. During the child-bearing period these patients with fibromyomas should be treated by conservative myomectomy. The use of radium in these younger women is destructive treatment and should be employed only in exceptional cases.

DR. F. S. WETHERELL, SYRACUSE, N. Y.—Several important points have been brought out in this symposium, which it will do no harm to reiterate. Dr. Dannreuther spoke very forcibly of the danger of the promiscuous use of radium emanation. A man who has not made a special study of radio activity and who, furthermore, presumes to use radium in gynecologic cases without having had a gynecologic training is bound to run into serious complications, which may mean more than mere disability to his patient.

The danger of a latent infection being lighted up by the use of radium in the uterus is one that must be ever foremost in the mind of the man using it. It was stated that infection may remain latent for five or six years. A case which I saw will make it plain that infection may remain latent for even a longer period. A woman was seen by me with her family physician. She was well bled out as a result of fibroids. Careful examination showed a freely movable uterus, with no apparent adnexal disease. Her past history showed that ten years before she had undergone a criminal abortion, which was followed by pelvic inflammatory disease, requiring a pelvic puncture. Despite negative findings in regard to the old inflammatory disease, this patient, following irradiation, developed an acute pelvic peritonitis with extreme distention of the intestines and for several days looked as if she were going to die. She finally recovered.

The fact that a careful history showed that there had been no acute inflammation in the pelvis since her operation, ten years previous, seems to me quite conclusive evidence that we must go carefully into the histories of these patients for even more than five or six years if we are to avoid this sort of thing.

NEW YORK OBSTETRICAL SOCIETY

STATED MEETING OF NOVEMBER 13, 1928

DR. DONALD MACOMBER, Boston, Mass., presented a paper (by invitation) entitled **A Statistical and Clinical Study of 1,000 Cases of Sterility**. (For original article, see page 621.)

DISCUSSION

DR. R. L. DICKINSON said he had heretofore repeatedly taken issue with Drs. Reynolds and Macomber because they did not present any statistics, particularly in their book. Here they come with the largest series extant.

Our old statistics must all be scrapped because the male was absent. We have here one of the first instances of an expert in the care of the male taking extended interest in the study of the woman. This is also important in that the study contains the largest series with the ovary inspected at operation. Dr. Dickinson hoped that when Dr. Macomber prints his lists he will describe in great detail those ovaries that have been inspected and those ovaries that have been stripped or opened up. His number of "cystic ovaries" constitute an outstanding feature of his list.

Boston has been the Mecca of the sterile for many years. Yet another prophet has arisen in New England. At a recent round table conference on sterility in Boston during the recent meeting of the American College of Surgeons, Dr. Meaker's group (Dr. Murray for the medical side, Allen Rowe, the biochemist, Dr. Vose, the urologist) presented human endocrine studies. They showed low metabolisms, as Littenberg has, with thyroid alone curing sterility in apparently healthy people. The weight that they laid on endocrine responsibility was striking. They found need of greater stress on male responsibility than on female. Meaker also brought forward 100 cervicitis cases with the statement that from the lack of reaction of bacteria and pus on semen, and absence of acidity he concluded that the trouble in the cervix was mechanical; purely a mucous plug.

DR. H. G. BUGBEE said this was the first time he had heard a discussion on sterility in which so much emphasis was laid on the part that the male takes. About 33 per cent of the patients sent to him (Dr. B.) have at least temporary sterility, but only about 5 per cent of them are actually sterile.

There are so many points that enter into the question of sterility in the male that it is quite impossible to even touch upon them all in a discussion. In the first place, if spermatozoa are obtained and they are motile and the patient is potent, Dr. Bugbee believed that the male can be practically excluded from the question; he may have a certain degree of impotence, but with the clearing up of some slight local lesion he will do his part. On the other hand, if spermatozoa are not present in the secretion, he did not believe that one should depend upon only one examination. The most accurate examination of the male secretion is the condom specimen, and at least two or three examinations should be made if the first one does not show spermatozoa. If there are no spermatozoa present, then there is an obstruction. If there are spermatozoa present and they are not motile, there is probably an infection along the genital tract. If there is an obstruction, it is a question of the patency of the epididymis, or the vas deferens, or the ejaculatory ducts. A complete obstruction of the epididymis is, in the great majority of cases, due to bilateral gonorrheal epididymitis, and if this is the case there is only one possible treatment that will offer any hope, and that is an anastomosis between the vas deferens and the epididymis. That is a rather delicate

operation, but in certain selected cases it is worth trying. Hagner, of Washington, has reported twenty-one cases, in eight of which he obtained a cure.

On the other hand, there is the question of the spermatogenic function of the testicle which may be destroyed by various infections. In 20 per cent of cases of mumps there is an orchitis; infections of the testicle as an adjunct to infections in other parts of the body as in tonsillitis, influenza, etc., are not uncommon. So that this phase must be taken into consideration.

Then there is the question of impotence, which is a very broad one and which cannot be passed over lightly. There is a psychic phase and a functional phase, and the question of seminal vesiculitis is an exceedingly important element. There are patients with atonic testicles, with no elasticity. When they have intercourse there is no discharge of semen at all, or if it is discharged the spermatozoa are dead in the semen. Local treatment very often brings them back to the extent of becoming active. Dr. Bugbee had seen quite a number of cases which were apparently impotent yet cleared up under local treatment to discharge normal semen, and conception took place.

DR. W. H. CARY said that this accomplishment is especially noteworthy because of the inevitable difficulties encountered in sterility study: first, the scientific limitations, particularly those relating to the production of fertile ova; second, the economic consideration because of meticulous detail and length of time required in investigation; and, third, the ethical problems which are involved in the study of sex functions.

Two major barriers to competent study might, however, he said be lessened in many cases; for instance, complete and accurate data of past illnesses and operations, which are rarely available when inquiries are made even to Class A hospitals, should be procurable if proper records were kept and correspondence fully answered. The speaker stated he had asked the American College of Surgeons for an opinion as to the practicability and desirability of hospitals giving patients, upon dismissal, a complete summary of relevant data. Another obstacle is the diagnostic prejudices of many sterility patients. Such a patient has had a "positive" tube test by one physician, a husband who "qualified" through some other medical agency, and with the cause of sterility still a mystery, comes to the expert expecting miraculous treatment when she should have been referred anticipating successful diagnostic study.

The speaker then briefly reviewed his own statistics for comparison with Dr. Macomber's. In 57 per cent of his cases failure of fecundation is due to some condition which prevents the union of the sperm cell and the ovum. In 33 per cent of the cases the obstruction is in the fallopian tubes; about 5 per cent will be opened incidentally to some patency test; and a few cases of gonorrheal salpingitis will subside and pregnancy follow if the husband and wife are properly treated. In the remaining 24 per cent the obstruction is in the cervix and due to some change in the cervical secretion. These 24 per cent are subdivided as follows: In 14 per cent the changes in the cervical secretion are due to endocervicitis. Dr. Cary disagreed with Dr. Macomber in that he does not consider laceration of the cervix a cause of sterility, unless it gives rise to an endocervicitis which defeats sperm cell migration. In 5 per cent the increase in secretion viscosity is due to passive pelvic congestion; and in the remaining 5 per cent it is due to lack of cervical canal drainage, the result of stenosis which may or may not be associated with antelexion. In an occasional case of secondary sterility, stenosis is due to traumatism. In this last 10 per cent the prognosis is excellent. Retroversion per se is not considered a cause of sterility by Cary. A complicating edema, however, may result in tube occlusion or cervix obstruction.

This leaves 43 per cent of cases in which sterility is due either to failure of the male or of the female to produce reproductive cells, or to some inherent de-

ficiency in the germ plasma. As statistics stand, the male carries that responsibility about three times as frequently as the female, but one should keep an open mind and consider that these figures are undoubtedly biased, for while we can examine the semen the same privilege is not accorded in the case of the ovum. Dr. Macomber may be right in attributing the importance he does to diminution in the number of the sperm cells, just as Dr. Moench may be justified in attempting to find an index of semen deficiency by counting the proportion of cells with variations in head lengths. As stated before this Society, Dr. Cary regards these two observations as indications of deficient spermatogenesis, but he cannot interpret them as sole indices of fertility. Biologists say that wherever there is an excessive production of reproductive organisms, such as the pollen of flowers, the seed of certain sea inhabitants and the sperm of mammals, a tremendous mortality is anticipated. Who knows when the destruction or abnormality of the semen becomes sterilizing? How can one determine it unless it be correlated with the reproductivity of the female? Girls are impregnated in whom the hymen has not been ruptured. The speaker has seen three cases in the last three months of women impregnated by a seminal leak that preceded ejaculation of semen.

A great deal of stress is placed on what the speaker calls purposeful activity of the sperm cells, by which he means an activity that varies from a mediocre motility in the same sense that a hurrying Wall Street crowd varies from a sauntering group in Central Park. After doing hundreds of postcoital tests of the semen, studying the migration of the sperm from the external to the internal os, with a fixed routine as to the preparation of the patient, the time after coitus at which the test is made, and the method of examination, he feels that he can at least measure the efficiency of sexual union in terms of sperm cell migration.

In closing, Dr. Cary said that there was something more to this question than the number, or the morphology, or even the activity of the sperm cells. He believed the next great step in this work would be the study of the life-carrying principle of the germ plasma, and that that advance will be made in the realm of physiological chemistry.

DR. MACOMBER (closing) said he agreed with Dr. Cary that cervical laceration in itself was not a cause for sterility, unless it is so marked as to lead to miscarriage.

It is the disturbance of the cervical secretion which results from the laceration that may interfere with conception. In order to make a classification concrete, something you can point to and put a large number of cases under, you must be somewhat arbitrary and the result is it leads to all sorts of misconception.

Dr. Macomber believed that the spermatozoa are a pretty good indication of the fertility of the male. Under the best conditions probably there will be one or two drops, possibly more, but usually less on the whole, of semen injected directly into the cervix. Now, the concentration of spermatozoa in those one or two drops cannot help being a factor in whether those spermatozoa are ever going to meet the ovum or not. He looked upon it largely from a physical point of view, rather than a biologic point of view. Dr. Macomber believed that the spermatozoa do not have purposeful motion, as if they were able to seek out the ovum, but that they ought to be considered very much as you consider molecules in a gas. We know that in a gas the molecules are all moving in different directions. If you introduce a gas like chlorine, for instance, into a confined space, the motions of the molecules of chlorine will eventually cause that chlorine to be diffused through the whole mass of the gas in the space in which they are put. What happens to the spermatozoa is a good deal like that. If there are enough of them they eventually spread along the lining of the uterus through the internal openings of the tubes and out into the tubes where there is some chance of their meeting the

ovum. From that point of view the concentration of the spermatozoa in the cervix is a very important thing. A very simple test of fertility is to count the number of spermatozoa per unit in the direct specimen of semen, which gives an index of the fertility of the man. It works out in practice; it correlates very closely with Dr. Moench's measurements of head lengths, with the size of the testicles and other elements of vigor.

DR. H. W. MAYES read a paper entitled **The Use of Mercurochrome as a Vaginal Antiseptic Before Cesarean Section.** (For original article see page 645.)

DISCUSSION

DR. R. M. BEACH said regarding the case of cesarean section reported by Dr. Mayes which terminated fatally, that during the sewing up of the peritoneum they probably punctured the intestine. The patient took the anesthetic poorly and while sewing up the peritoneal cavity, she was coughing and protruding her intestines into the wound. She was a perfectly clean primipara with unruptured membranes, and there was no reason why she should become infected at all.

DR. E. C. LYON, JR. stated that at the Woman's Hospital they had followed the technic described by Dr. Mayes in vaginal deliveries for a period of nine months, and had been very much impressed by it, especially in the last group which they had had. During August, September, and October of 1928, they had 128 deliveries in the ward with one case of morbidity due to sapremia, but with no cases of sepsis.

DR. MAYES (closing) said in reply to Dr. Bingham, as to the value of the aqueous solution of mercurochrome as an antiseptic, that they have been using a 4 per cent solution of mercurochrome on the obstetric service of the Methodist Episcopal Hospital for over four years. He believed it has a definite germicidal value because of the marked reduction in the morbidity since beginning its use and by the results of a bacteriologic study of the vagina and cervix at the time of delivery. A report of this work will soon be ready for publication.

Dr. Bingham certainly had an excellent record in his series of inductions. In Dr. Mayes' series before the use of mercurochrome, there was a morbidity of 29 per cent with two deaths from sepsis in 92 cases, while with mercurochrome there were 98 cases with a morbidity of only 9 per cent and no deaths from sepsis.

The value of mercurochrome is also shown by the hospital records during the last twelve months, during which 2065 cases were delivered with a morbidity of 5 per cent. In this series there were 10 maternal deaths. Of these one death was due to sepsis and this woman had a short labor and an easy spontaneous delivery. She had a staphylococcus infection which spread upward from the placental site. Five of the mothers died within twenty-four hours of delivery and one of these 5 was not delivered. The causes of death were given as follows, toxemia in three cases; shock and hemorrhage in four; pulmonary embolus in one; hyperemesis gravidarum in one; and infection in one.

PHILADELPHIA OBSTETRICAL SOCIETY

STATED MEETING, JANUARY 5, 1928

DR. FRANCIS J. McCULLOUGH reported a case of **Full-Term Extrauterine Pregnancy With Living Child.**

Mrs. M. L., aged thirty-six, para four, was admitted to the Department of Obstetrics, Jefferson Medical College Hospital, on May 8, 1927, with a tentative diagnosis of premature separation of the placenta. Menstruation normal, the last period occurred in August, 1926.

There was no history of pelvic infection nor had the patient ever been operated upon. She was married at the age of eighteen and had three previous pregnancies with normal labors at full term, the first in 1911, the second in 1913, and the third in 1919.

The patient experienced the usual "sick stomach" during the early part of her pregnancy. At the end of the second month, she had slight bleeding from the genital canal. This continued for several weeks. A provisional diagnosis of threatened abortion was made and the patient was kept in bed from November 1 until December 15, a period of forty-five days.

Ten days before she was advised to remain in bed, she experienced a severe attack of abdominal pain. This was accompanied by syncope. The attack was precipitated, she said, during a bowel movement. At this time a diagnosis of ectopic pregnancy was made and an operation was advised.

The patient was confined to bed for several days and during this time suffered considerable abdominal pain, distention, nausea, and vomiting. After rest in bed, the abdominal symptoms subsided and she gradually improved. On January 1, 1927, she resumed her household duties and remained well until May 8, 1927. On this day, following a bowel movement, the patient again suffered a violent attack of acute abdominal pain.

She was admitted seemingly in an extremely serious condition, pulse 120, temperature 95° F., and leucocyte count 18,000. She presented the clinical picture of a patient suffering with an acute peritonitis.

The abdominal wall was exquisitely tender and board-like. Fetal parts, owing to marked rigidity, could not be palpated, nor could heart sounds be heard. The enlargement of the abdomen corresponded, however, to a full-term pregnancy. Surrounding the umbilicus, there was an ecchymotic area, or a bluish black discoloration.

Pigmentation, typical of pregnancy, was found on the face, breasts and mid-abdominal line. There was no discoloration of the vaginal mucous membrane, and the cervix was not soft. There was no vaginal bleeding. No presenting part could be felt on vaginal examination.

At immediate operation a free median abdominal incision was made. On entering the peritoneal cavity a full-term child was found. This was removed without difficulty. The baby, a male, was perfectly developed and weighed seven pounds and three ounces. There was only a small quantity of amniotic fluid. At several points, the amniotic sac was adherent to the stomach. The placenta was attached to the right broad ligament and to the structures in general on the right side of the lower abdomen.

On account of the broad attachment of the organ, no attempt was made to remove it. The membranes were delivered through the abdominal wound and stitched to the parietal peritoneum, the amniotic cavity being packed with sterile gauze at the same time.

During the first thirty-six hours after operation, considerable blood oozed from the wound, requiring several changes of dressings. Two days after operation the general condition of the patient was good.

On May 14, six days following operation, a part of the gauze was removed and on May 16, all the packing was withdrawn. The patient continued to improve from day to day. At times, there was some bloody discharge from the incision, but this was not alarming.

On May 22, however, fourteen days following operation, the patient developed a temperature of 103° F. This was preceded by a chill and she also experienced considerable pain in the right lower abdomen. On May 25, seventeen days after operation, there was considerable bleeding from the wound. An examination was made and the placental mass was found close to the abdominal wall. From this time on, there was a slight discharge of blood from the abdominal incision.

On June 1, twenty-four days subsequent to operation, a violent hemorrhage developed, from which the patient succumbed within a few hours.

DISCUSSION

DR. WALT P. CONWAY said he saw a case, somewhat similar to the one just reported, in the Atlantic City Hospital about twelve years ago. This was the only one in the hospital during a term of about twenty years and was reported before this Society. The woman was admitted with a diagnosis of abdominal pregnancy, with a probably dead fetus. Laparotomy revealed a dead fetus on the right side of the pelvis. The placental vessels were thrombosed and the ovisac was entirely within the right broad ligament. It was a right tubal pregnancy, unruptured, at term. On account of the purulent character of the fluid, drainage was inserted in the lower angle of the wound. The baby and the placenta together weighed about 5 pounds. The patient made an uneventful recovery.

DR. W. R. NICHOLSON said that about twenty years ago at the Gyneccean Hospital, he had his only experience with full-term extrauterine pregnancy. When this patient was admitted the child was dead. There was no history of symptoms suggesting rupture at any time during her pregnancy, but one month before admission she went into what her attendant diagnosed as labor. The doctor, according to her statement, was with her all night, urging her to bear down. The diagnosis in this case was moderately easy, because one could definitely feel the head presenting in Douglas' culdesac, entirely outside the cervix. This was very easily appreciated. At operation he was able to deliver the placenta without hemorrhage. Of course this is a usual experience when the child has been dead for some time. On the other hand, in the case of a living or but recently dead child, a placental removal is often so hazardous a procedure that it is best to avoid it unless it is very easily removed, or, in other words, unless it can be ascertained that it is not attached over large blood vessels. In case that removal of the placenta seems to be out of the question, Dr. Nicholson believed that it is much wiser to pack the amniotic cavity, leaving the lower angle of the wound open, than to close the wound entirely with the idea that the placenta will be later absorbed.

DR. CHARLES C. NORRIS said that the most interesting problems that these cases present is the question of how best to deal with the placenta. Dr. Polak and others have suggested and practiced closing the abdomen leaving the placenta in situ. Dr. Norris had no personal experience with this procedure, but, however, had operated upon two cases of lithopedia which were both apparently at term and in which no trace of the placenta could be found,

DR. BARTON COOKE HIRST described the case of a woman who came to his office stating that she had ceased to menstruate fourteen months before but the period had returned regularly for the past five months. She had a huge abdominal tumor. He could feel the unimpregnated uterus pressed down and backward by the tumor above it. There was an entire absence of the signs of pregnancy. Dr. Hirst operated on her the following day believing she had an ovarian cyst but found a full-term pregnancy with an overgrown fetus. Had an x-ray picture been taken the mistake in diagnosis would have been avoided. He had no difficulty with the placenta which was removed entire. Dr. Hirst had two other cases at six months, treated in the same way. In regard to Dr. Polak's recommendation, a letter he received a short time ago would make him hesitate to leave the placenta in the abdominal cavity. A practitioner in the west impressed by Polak's recommendation, left the placenta in the closed abdominal cavity, but three hours later there was a separation of the placenta from its attachments and the woman bled to death.

STATED MEETING, FEBRUARY 2, 1928

DR. BERNARD MANN presented a report of a case of **Abdominal Delivery of Triplets.**

D. F., white, aged twenty-six years, primipara. Menstruation began at fourteen years, every twenty-eight days, 3 to 4 days' duration, moderate flow, always painful. She last menstruated April 15, 1927. Nausea and vomiting were severe for the first four months. The urine showed slight trace of albumin. The patient's mother had had twins. There was no other multiple pregnancy in her family nor in her husband's family.

She was seen for the first time on November 23, 1927, in consultation at the Children's Homeopathic Hospital. She had been in active labor for the past twenty hours, having severe bearing down pains which were almost continuous. The abdomen was tense, and appeared larger than the average at term. Palpation caused severe pain. The uterus being firm and in continuous contraction it was impossible to outline the fetal body. Fetal heart sounds were heard. The cervix not entirely effaced and about four fingers' dilatation. The membranes were bulging. The presenting part was high up and not engaged.

The diagnosis was either an overgrowth of the fetus or multiple pregnancy. In view of the above findings it was thought best to do a section.

Triplets were delivered by cesarean section. One male weighing 4 pounds 14 ounces and two females, one 4 pounds 11 ounces and the other 4 pounds 5 ounces. They appeared healthy and cried shortly after birth. The male baby which was second to be delivered had its cord twisted around its neck twice. The position of the third was transverse.

The placenta was about twice the average size, three distinct amniotic sacs, and three cords. The uterine wall was quite thin and there was more bleeding than one finds in the average cesarean section. This was satisfactorily controlled by a second ampoule of pituitrin.

The third day following operation, she developed a cough, elevation of temperature to 101°, pulse 90 and respiration 30. Examination of the chest revealed a lobar pneumonia in the left lower lobe posteriorly. Blood count was R. B. C. 5,250,000, Hb. 75 per cent. W.B.C. 15,000. Polys. 85 per cent.

At no time was there abdominal distention, and after the fourth day there was no pain in the abdomen. The lochia were normal. The uterus was well involuted, freely movable and normal position. The sutures were not removed until the fourteenth day on account of a cough.

On the tenth day the temperature was normal and she was discharged in good condition on December 11, 1927. Eighteen days following the delivery, the babies were healthy and gaining in weight.

The statistics for the birth registration area of the United States for 1925 show that there were 1,878,880 births. There were 21,536 sets of twins or 1 in 87. There were 246 sets of triplets or 1 in 7800. There were 5 quadruplets or 1 in 375,776.

STATED MEETING OF MARCH 1, 1928

DR. CHARLES W. BURR (by invitation) read a paper entitled **Neurologic Symptoms in the Pregnant Woman**. (For original paper see page 653.)

DISCUSSION

DR. EDWARD A. STRECKER (by invitation) spoke on psychiatric manifestations in obstetrics and gynecology, and said that it is interesting to determine just why that portion of the human anatomy which has to do with sex life and procreation should occupy such a prominent rôle in the symptomatology of the neuroses and more indirectly of the psychoses. In the first place, the sex organs and their appendages constitute the channels for the expression of a powerful instinct. Psychologists disagree about most things, and they disagree with such vigor and vindictiveness about the number of our instincts, but they are in accord in their belief that along with self-preservation, sex and self-perpetuation are dominant in the instinctive demands they impose on the individual. Just as "murder will out" so will an instinct find expression in our everyday conscious life and determine much of our behavior. If this is true normally, it is doubly true in abnormal mental life or insanity and in the neuroses, since both are often queer and distorted outlets and refuges from the too difficult impositions of actual life. This is one reason.

Another reason is that sex and sex practices are indissolubly bound up with history and evolution of the human race. Unquestionably many of the religious ceremonies of primitive man were primarily and openly sexual in their significance. Some of the rites and festivals which are still observed may be traced back to remote times where they were frankly appeals and sacrifices to the gods who presided over the sex destinies of the individual and its fruition. Within the period covered by recorded history, there runs the same thread of sex and great interest in anything pertaining thereto. In that sanitary code known as the Mosaic law and in other formulas of civilized people, particular attention is paid to the menstruating woman. She is labelled as unclean, and it is inferred that she is poisonous, since she is not only forbidden to have intercourse but even to touch growing grains and crops. Somewhat ingenuously but rather unscientifically the Freudians have inculcated this into their doctrine so that when a woman dreams that while menstruating she has sex relations with her husband, it is interpreted as an unconscious desire for the death of the husband. Furthermore, sex for the average person is clothed in mystery. Many individuals otherwise fairly intelligent earnestly believe and suggest to the psychiatrist, that the cure for mental deviation or nervous disorder is the re-establishment of the menstrual function or sex intercourse or an operation on the genital tract. Without expounding the theme at too great length, it is clear that our sex heritage is heavy and that it permits of obscure interpretations so that the mind which is neurotically or psychotically inclined readily finds fascinating material to elaborate.

Finally, the complex system of modern civilization has necessarily operated to frustrate the complete exercise of sex life and childbearing. Monogamy is the rule. Marriage must often be deferred for economic reasons and many

women are denied a mate. The bearing of children may be postponed because of economic stress or for even less valid factors, and naturally this has led to the utilization of various contraceptive devices which are psychologically more or less harmful. The symptoms of a neurosis or psychosis not infrequently are derived from previous repressions, distortions or denial of sex satisfaction. These then are some of the reasons why the genital tract competes with the gastrointestinal canal as a favored site for the fixation of neurotic or psychotic symptoms.

The idea that there is either a gynecologic or obstetric psychosis which is specific is almost as obsolete as is the notion of the ancient Greeks that hysteria was due to the wandering of the womb about the body. In regard to the psychiatric aspects of gynecology Dr. Strecker felt that the most that can be said is that because sex is an instinct, because of the sex heritage of the race and the mystery with which it is clothed, because of the impediments and restraints which the code of civilization of necessity places in the way of natural and complete sex expression and satisfaction and for other reasons, many of them to be found in the personal sex life of the patient, it must be expected that the clinical picture of neuroses and psychoses will contain many details which refer either openly or indirectly to the genital apparatus.

DR. BARTON COOKE HIRST said he could not agree with the opinion that there should be a combination of a gynecologist and a neurologist in constant association during the treatment of a case mainly neurologic. In his opinion the gynecologist should do what work the physical condition of the patient requires and should then retire. His continued presence may easily contribute to the worst displacement of the pelvic organs known—they occupy the woman's mind.

Dr. Hirst's main interest in these neuropsychics is to avoid being misled by simulated symptoms, concealment of basic facts or false statements. A woman complaining of very frequent urination without any demonstrable cause, after a careful study, is fairly certain to be addicted to masturbation. One woman came to him in great distress of mind because her daughter, a girl of seventeen, well born, well bred, with every financial and social advantage, had coolly informed her mother that she proposed to lead the life of a courtesan and had already begun to do so; a second *Ninon de l'Enclos*. An examination revealed an intact hymen, and subsequent investigation showed that the girl was masturbating incessantly and revelling in the thoughts of sexual indulgence.

Dr. Hirst cited several cases of psychic disturbances with intentions to delude, among them an intractable case of metrorrhagia in a young girl which resisted all therapeutic measures and was found to be due to a stab wound of the uterus inflicted on it every morning with a hat pin.

THE CHICAGO GYNECOLOGICAL SOCIETY

MEETING OF JUNE 22, 1928

DR. EMIL RIES presented a specimen showing the **Effect of Lipiodol Injection on the Tubes.**

The patient, a woman thirty years old, consulted Dr. Ries three years ago because of sterility. There was no tumor in the pelvis. She was given an insufflation test, but the air did not go through. A year later the same test was repeated at Rochester, Minn. She was informed that nothing went through. Early this year she consulted another Chicago gynecologist, who tried to pass a gas through the tube and found it did not go through. He then made a lipiodol test and obtained a plate which appeared to show that the lipiodol went through. This picture was taken very shortly after the injection. The woman then felt all right.

There was no reaction of any importance after the lipiodol but about two months afterward she began to get sick and to have pain. Early this month she consulted Dr. Ries.

The abdomen contained tumors which could be palpated from the outside. Vaginal examination showed the uterus in place. On the left side there was a cystic mass which extended up to a mass which could be felt on the outside, and on the right side a small mass could be felt. He thought it was a salpingitis and felt that the only chance of saving any of the organs was to operate.

When he opened the abdomen, the adhesions were so extensive that none of the pelvic organs were visible. The peritoneum was adherent to the omentum, the omentum was adherent to the uterus, the sigmoid flexure was adherent to the appendix, and the bladder was drawn up over the anterior surface of the uterus on the right side, so that it was adherent to the right appendage. On dissecting away the omentum he found cysts and walled off fluid among thin adhesions. Examination showed that this fluid was sterile and it contained no iodine. On lifting up the small intestine he found on the under surface of the mesentery of the small intestine stone-like formations imbedded in the serosa of the mesentery. Further examination revealed at least twenty-five of these masses. They showed no structure and could be easily broken with the thumb nail. They contained no iodine and consisted of cheese-like masses held together evidently by some strands of connective tissue. These stone-like formations were present not only on the mesentery of the omentum but in the adhesions in the pelvis. All the way down to the bottom of the culdesac was a mass of adhesions which formed a rather thickened cyst in the culdesac containing small masses of these concretions.

Both tubes were dissected out, leaving behind the right ovary. On the right side there was an open fimbriated end with the tube thickened and hardened so that it was hardly possible for anything to go through. But theoretically this tube was patulous from the uterus to the abdominal cavity. On the left side there was no opening at all. The mucosa of that tube was also enormously thickened. There were grayish crusts in the tube. The microscopic examination of these tubes showed a most unusual picture. The tubal mucosa had disappeared in large areas. In other areas the lining was a typical tubal epithelium. There were enormous quantities of giant cells and in these were found greenish masses without structure, homogeneous in appearance in places and in other places more granular. Some of the cells contained small particles of this green substance. This condition prevailed in both tubes, in the open as well as in the closed tube.

Dr. Ries concluded that at the time of the last gas and lipiodol injection, as regards the adhesions, it was possible for the air to go through the open tube and yet escape recognition. One could not hear it go through, and the x-ray would not show it in the pelvis because it would be difficult to tell whether it was gas in the bowel or gas in the peritoneal cavity. The only way to be sure that gas has gone through is to find a gas bubble between liver and diaphragm, and the adhesions in the pelvis of this case might prevent that. This case showed such serious damage to the tubal tissue that careful experiments should be done to decide whether it is justifiable to inject lipiodol where there is a question of retaining a functioning tube. If it turns out that the tubes are damaged regularly in this same way, lipiodol will have to be used with considerable reservation.

DISCUSSION

DR. LOUIS RUDOLPH said this patient was seen by him in October, 1927, at the request of her physician, who said that the patient had a negative pelvis except for a mass on the left side which he diagnosed as an ovarian cyst, and asked that a Rubin test be made. The test was made but Dr. Rudolph was unable to get any air through with pressure up to 200 m. On December 1, 1927, he was asked to do

a lipiodol test. There was no reaction, as Dr. Ries said. He saw her again January 22, 1928, at which time there was a negative pelvis with the exception of a left ovarian cyst. She telephoned him six weeks later and said she was in good health. She later saw Dr. Ries.

DR. SYDNEY S. SCHOCHET said there were one or two points which might be of interest regarding the experimental side of lipiodol. Some time ago Dr. Stein was very enthusiastic about organic iodine, and he and Dr. Schochet were studying the problem of tissue reaction to lipiodol. The full text of this work will be later presented by Dr. Stein, but it may not be amiss to speak of some of the things observed in the uterus of the guinea pig.

They noticed that in those animals in which lipiodol passed through into the peritoneal cavity most of the lipiodol was taken up by the omentum. Dr. Ries's failure to obtain the test for iodine may be due to the fact that lipiodol is an organic compound and unless it is saponified, the routine test for iodine gives negative results.

Another interesting thing they noticed was the effect on the mucosa. There was a marked edema and the presence of leucocytes (lymphocytes). The animals were injected under sterile conditions. An opening was made through the anterior abdominal wall, and the horns of the uterus were ligated, so there would be no infection from the vagina or cervix.

DR. GUSTAV KOLISCHER presented a paper entitled **Modern Conceptions of Renal Derangements in Pregnancy**. (For original article see page 661.)

DISCUSSION

DR. CAREY CULBERTSON said that Dr. Kolischer's explanation of what kidney derangement means is brought down to the lowest common denominator, that kidney change is due to the retention of toxic products, the end products similar to the changes which take place in the liver. This, of course, has been recognized as the probable thing for some time, that is to say, the changes are due to the things that are causing intoxication of the system as a whole. The essayist has brought this out very clearly in his reference to retinitis, namely that retinitis is not due to kidney change but is one of the symptoms of a general metabolic breakdown. His explanation of the relation between these changes and eclampsia and the preeclamptic state were covered in the same way. This means that in the prenatal clinic the patient must have all of the same careful laboratory work which the pregnant patient in the hospital has after she has come in in labor or in eclampsia, or without labor showing a preeclamptic condition. That means, of course, that the prenatal clinic must be provided with all the laboratory advantages that the hospital patient has.

In recent years our ideas have changed regarding the appearance in pregnancy of pyelitis. It was formerly thought that pyelitis was a thing that occurred late in pregnancy. It is now known that it is found early in pregnancy. Case after case is seen where a careful study of the history of preceding pregnancies showed pyelitis to be present but unrecognized. Dr. Culbertson recently saw such a case, a para iii. She was in the third or fourth month of her third pregnancy, the last child having been borne twelve or thirteen months previously. She undoubtedly had a pyelitis then, but it had not been recognized. The pyelitis present in this third pregnancy was merely a "hang-over" from the pre-existing one that had been pressed along.

DR. C. S. BACON asked about the indications for the nonspecific protein reaction which Dr. Kolischer spoke of as a diagnostic and therapeutic agent, and under what condition would he consider it indicated.

DR. KOLISCHER in closing said that it was well known that in certain infections the administration of any foreign protein will act favorably. The injection of milk is of value. In other cases the administration of casein is of value. As to the indications for the use of these foreign proteins, the injection of milk leads not only to a very severe local reaction but to a general reaction. Pregnancy is always a barrier to a certain extent, and consequently such a reaction would be undesirable. By the injection of the patient's own blood there is no local reaction and no general reaction. The usual technic is to take 8 to 10 c.c. of the patient's blood under the usual aseptic precautions and to inject in the gluteal muscle. A few days afterward the elimination is improved. This uniformly good result is explained by the fact that the reticular endothelial system is stimulated by these protein injections. The presence of edema may be explained in two ways. In nephrosis on account of the accumulation of chlorides within the tissues, water is attracted and retained. This is the nephrotic edema. It is known from the work of Jaffe and Petersen that bacterial toxins produce extreme permeability of the capillary walls. Edema in this condition is nothing else but a toxic transudation. Edema in nephritis means a very severe capillaritis. There is an old tradition that if there is any renal derangement the patient should be flushed, and an enormous quantity of water is administered. That is a mistake. One of the features of the treatment in nephritis is restriction of the intake of fluid. In nephrosis a simple way to prevent edema is to restrict the intake of salt. The human body under all conditions will eliminate a certain amount of chlorides. If the supply is cut off, then the body is forced to draw on its deposits within its own structure, and this part of the chlorides is eliminated, thus relieving the edema. The taking away of salt from a patient with nephritis is very disagreeable to the patient and of no therapeutic value.

There is one test which is not applied as often as it ought to be, the so-called concentration test. If in a patient with normal kidneys the fluid intake is entirely cut off for ten hours and the urine examined at regular intervals, it will be found that the specific gravity will constantly rise. The kidney that is altered in its function will show either a steady level of specific gravity or the specific gravity will decrease, which means that such a kidney without water supply is unable to eliminate the necessary amount of solids. There is no one single method of testing the kidney function. The kidney has three distinct functions, the production of urine, the elimination of waste products of organic and inorganic origin, and the elimination of water. Each of these functions has to be tested separately. As far as testing the reticular endothelial system, it is a matter of biochemic examinations, and their results may add very important data to the clinical picture.

DR. S. J. FOGELSON by invitation presented a paper entitled **Cholecystography as an Aid in Determining Gall Bladder Stasis in Pregnancy.** (For original paper see page 613.)

DISCUSSION

DR. MARK T. GOLDSTINE said he was especially interested to see what this would do for pregnant women clinically. These patients come in with rather severe attacks of dyspepsia, pain in the upper right quadrant, some nausea and vomiting, and the vomiting of a bitter fluid. Dr. Goldstine found that a fat meal afforded relief. Possibly these attacks of pain in the right upper quadrant with indigestion and stasis are associated with infection, a cholecystitis, and the fat meal, while not particularly relieving stasis, does help the gall bladder to drain into the duodenum and prevents the bile from backing up into the stomach. In this way relief of symptoms is obtained, and with better drainage likewise relief from the infection.

DR. EMIL RIES said it must not be forgotten that men have gallstones as well as women, and to prove that there is anything in pregnancy that predisposes to gallstones, one would have to prove the overwhelming frequency of gallstones in women in comparison with men. All the statistics are mostly worthless because they are not taking into account the comparative numbers of men and women in certain regions, the comparative number of women who have been pregnant and who have not been pregnant in the same region. If medical statistics were not in such a chaotic condition, one might draw some conclusions from them.

He said that in 1889 he wrote a doctor's thesis on albuminuria of pregnancy and its connection with eclampsia. In those days the theory of the pressure of the uterus on the ureter causing albuminuria of pregnancy was generally believed. He proved in his thesis that it might be the cause. The profession has since retreated considerably from the idea of the possibility of organs packed together in the abdominal cavity squeezing each other. They can squeeze only under very abnormal conditions and only when they are fastened there. Only those cases have we allowed as causing pressure. The old idea of the retroflexed uterus pressing on the rectum and causing constipation was a similar idea. There is no more question of pressure from the retroflexed uterus on the rectum than there is of the liver pressing on the colon. And so Dr. Ries is not inclined to pay much attention to any idea of pressure of the pregnant uterus on the ducts and gall bladder, but there might be some conditions in pregnancy that help to lead to the formation of gallstones. Examination of the cholesterol content of the bile in pregnancy and outside of pregnancy and the connection of the cholesterol deposits with stone deserve more attention than the old idea of pressure. It does not belong to the subject of the evening, and probably the essayist did not want to consider it. He just tried to prove or disprove one particular cause that has been mentioned, namely the question of stasis.

DR. A. F. LASH said that Dr. Roos of the Rockefeller Institute definitely proved that dysfunction rather than stasis of the gall bladder due to disturbances of metabolism in this viscus was the cause of stone formation. Owing to the increased production of cholesterol in pregnancy, gallstones should be more common in pregnancy due to disturbances of metabolism in the gall bladder associated with the general changes in pregnancy.

DR. FOGELSON, in closing, said this phase of the work is just one unit of the problem. No one can consider cholelithiasis without considering cholesterol formation in pregnancy. Another important factor which was not mentioned by the discussors is hypercalcemia. Those two factors must be considered in considering etiology of gallstones. German authorities seem to be of the opinion that the cholesterol content of the blood is higher in the first half of pregnancy than in the latter half. That is significant as most of these biliary attacks begin in the last trimester of pregnancy. So he looks a little askance at cholesterol.

It likewise has been demonstrated that with a change in the hydrogen-ion content there is a definite precipitation of calcium in the bile, the precipitated calcium particles acting as nuclei for stone formation.

In answer to Dr. Goldstine, Dr. Fogelson noted improvement in all six cases. The first patient was five months pregnant and definitely jaundiced. She improved almost miraculously on the feeding of egg yolks and cream. With the work Ivy has done in developing cholecystokinen, there is now something with which stasis can be eliminated in this gallstone formation. With stasis eliminated in the formation of gallstones, further work is now being done upon the other factors, namely hypercalcemia and hypercholesteremia.

Correspondence

The Estimation of Histologic Malignancy From Biopsy Sections

To the Editor.—In a recent communication Martzloff¹ reported his investigations into the prognostic significance of an evaluation of the histologic structure of biopsy sections of carcinomata of the uterine cervix. He came to the conclusion that in about 30 per cent of the 70 cases examined a discrepancy existed between the predominant cell type observed in the biopsy sections and that seen in the numerous sections taken from the parent tumor after surgical removal of the uterus. On the basis of these observations he attempted to discredit the work of several radiologists (Schmitz and Hueper², Boehm and Zweifel³ and others) who used biopsy sections for the determination of histologic malignancy. His criticism is based upon the assumption that these workers used the predominant cell type present in these sections as the sole criterion on which to draw their conclusions. Furthermore he apparently tried to produce the impression that they made their statements somewhat carelessly as they omitted to ascertain the fact if the findings of biopsy specimens can be regarded as representative for the whole tumor. As his paper contains a number of fundamental errors and is also otherwise open to criticism, I do not consider it opportune to leave his assertions unchallenged.

1. The work of Hueper and Schmitz represents the results of investigations of a histopathologist in conjunction with a radiologist.

2. A more careful study of the papers of Schmitz and Hueper as well as of Boehm and Zweifel would have shown Martzloff very readily that these authors do not use the cell type as the only criterion for the degree of malignancy. The histologic malignancy index (Hueper) represents the end result of a numerical evaluation of nine different factors of which the degree of cellular differentiation is one. I may add that I have recently increased the number of factors even to twenty including also those pertaining to the antiblastic qualities of the stroma. The relative prognostic significance of the degree of differentiation is by this procedure still more decreased. It is obvious that all the conclusions drawn correlate the prognosis with the malignancy index and not with the cell type. We decline, as that is expressively stated in the paper referred to by Martzloff, to draw any conclusions upon the prognosis from the cell type alone. This method appears to us by far too one sided and open to individual interpretation and is therefore regarded as inferior to ours. We are supported in this standpoint by the investigations of Plaut⁴ and Kahlstorf⁵ who criticized rather severely all those methods of malignancy determinations in which the degree of differentiation represents the exclusive criterion and in which no consideration is given to the degree of anaplasia, infiltrative growth, cellular character, condition of the stroma, etc. Similar misinterpretations exist in regard to the work of Boehm and Zweifel. They stress the point that not only the status of the carcinoma cells but also that of the stroma has to be taken into consideration. Besides the degree of cellular differentiation they evaluated the nucleocytoplasmic ratio, the number of mitoses, the degree of leucocytic infiltration of the stroma, the cellular character of the tumor, the condition of the cytoplasm of the carcinoma cells, the character of the stroma. It is obvious from this discussion that the methods employed by Hueper and Schmitz and Boehm and Zweifel differ considerably from that used by Martzloff. His criticism is therefore wholly unfounded in one of the fundamental issues of his paper.

3. His second main objection, which is contained in the sentence "It is essential to know as a minimal requirement how valuable biopsy material may be in its ability to reflect cytomorphology of the parent tumor," lacks also any foundation as far as my work is concerned. I employed an even more critical method than Martzloff in ascertaining the facts in regard to this relation. The sections taken from ten or twelve different places of cervical carcinomas of several uteri were mixed after they had received the proper designations not visible to me during the examination. After the evaluation of the histologic structure in all sections had been completed, the results obtained in the different sections of the same carcinoma were compared. This procedure was repeated several times during the past three years. As the result of this study I can state that biopsy sections if properly taken according to the rules laid down in several of my papers are with very rare exceptions a reliable index of the histologic structure of the parent tumor. This observation is, moreover, supported by the investigations of Lahm⁶ and quite recently also of those of Healy⁷ from reports of the laboratory of Memorial Hospital (Ewing). Martzloff's work cannot be regarded as the final and definite answer to the question raised by him to say the least.

4. But also from other viewpoints the study of Martzloff appears to me not very convincing. In about fifty per cent of the photomicrographs used as pictorial evidence of the existing discrepancy between the predominant cell type in biopsy specimen and parent tumor, retouches are made (Figs. 8, 10, 11, 14, 15). In Fig. 15 the presence of retouches is not noted in the description. Without these retouches the histologic structure of the sections as present in these pictures does not differ considerably. The conclusive force of the pictorial evidence offered is impaired by such a procedure. Moreover, different magnifications are used for the pictures taken from the sections of the same tumor. A fair comparison of the pictures is made impossible by this technical defect. Furthermore the pictures cannot convey any definite information in regard to the predominant cell type present in the sections, as it is very often possible to demonstrate in cervical carcinomas with their more or less mixed cellular structure smaller areas in which the cell types present differ completely.

REFERENCES

- (1) *Martzloff*: AM. J. OBST. & GYNEC. 16: 578, 1928. (2) *Hueper and Schmitz*: Strahlentherapie 24: 660, 1927; Am. J. Roentgenol. 16: 30, 1926; Radiol. 11: 361, 1928; Strahlentherapie 30: 650, 1928. *Hueper*: Surg. Gynec. Obst. 47: 502, 1928. Arch. Path. 6: 1064, 1928. (3) *Boehm and Zweifel*: Zentralbl. f. Gynack. 50: 30, 1926. (4) *Plaut*: Surg. Gynec. Obst. 43: 450, 1926. (5) *Kahlstorf*: Ztschr. f. Krebsforsch. 26: 420, 1928. (6) *Lahm*: Strahlentherapie 25: 22, 1927. (7) *Healy*: Symposium on Cancer Therapy, Congress of the Radiological Society of North America, Chicago, 1928.

WILLIAM C. HUEPER, M.D.

February 15, 1929.

2537 PRAIRIE AVE., CHICAGO, ILL.

Magnesium Sulphate Dosage in "Synergistic" Analgesia and in Tetanus

To the Editor.—As an incidental contribution to the controversy which has arisen between Gwathmey¹ and myself² over the alleged synergism of magnesium sulphate and morphine, it has occurred to me that it might be very profitable to institute a comparison between the dosage of magnesium sulphate when used alone in the treatment of tetanus and the dosage of the same drug when used in combination with morphine in the so-called "synergistic" analgesia. In the treatment of tetanus it is granted that any measures, however drastic, which will control the spasms are justified since if successful they conserve the precious strength of the patient; hence, the employment of otherwise prohibitive doses of all the sedatives. But in the induction of the state of analgesia, whether obstetric or postoperative, it is necessary that the minimum physiologic disturbance be set up consistently with accomplishment of the desired effect; which accounts for the constant effort to administer sedatives here in minimal doses.

Let us see to what extent these dicta are heeded in the several parenteral uses of magnesium sulphate.

Magnesium sulphate in tetanus.—The method of using the drug in the symptomatic treatment of tetanus has been nowhere better described than by Smith and Leighton,³ one of whose case reports is here reproduced.

"Case Report: Mrs. L. L., sixty-eight years old, was sent to the Lutheran Hospital by Dr. Reinhold Speer on June 25, 1922. She gave a history that her jaw became locked four days before admission. She had spasms in her throat and could not swallow. The patient had an abscessed tooth about three days before the symptoms began and presented a complete prolapse of the uterus with ulceration of the parts. The incubation period was not definite as the point of origin was uncertain. On admission the patient had extreme trismus with rigidity in the neck and legs. The recti muscles were so rigid that they felt like steel plates. The temperature was 99.4° F. and the pulse was 120. She had not been able to take food or drink for several days. The patient was given 3000 units of antitoxin and 30 grains of chloral hydrate at once. Ten thousand units of antitoxin were given intravenously and 16 c.c. of a 25 per cent solution of magnesium sulphate were given every five hours. On the next day, June 26, the condition was much improved. The spasms in the jaws, legs and recti muscles were distinctly lessened. The patient could take food and water and had slept fairly well during the night. On the next day, June 27, the patient could open her jaws fairly well and was quite comfortable and free from spasms. Twenty thousand units of antitoxin were given. On the following day, June 28, three days after admission, the magnesium sulphate injections were stopped, as considerable local irritation was occasioned by the injections. The next day, June 29, the muscles were again quite rigid and painful, so that the magnesium sulphate injections were again employed, and twenty thousand units of antitoxin were given intravenously. After a few hours the patient was sleeping and her condition was decidedly improved. On June 30 the injections of magnesium sulphate were stopped again. The rigidity increased somewhat but was relieved by the further employment of magnesium sulphate. On July 3, eight days after admission, 1500 units of antitoxin were given subcutaneously. The patient returned home July 9 entirely relieved.

"Comment: This was a very severe case of tetanus in an old woman. Her condition had been getting worse daily. She received a total of 54,500 units of antitetanic serum. On three different occasions the spasms recurred after the magnesium sulphate had been discontinued, and each time the spasms were relieved again by injecting magnesium sulphate. The effect was so convincing that I feel certain that the recovery was largely due to the effect of the magnesium sulphate."

It will be seen that the dose of magnesium sulphate which was sufficient to control the spasms in this severe case of tetanus for a period of five hours, which it did repeatedly, was 4 gm. (16 c.c. of a 25 per cent solution).

Magnesium sulphate in postoperative analgesia.—In the paper of Glass and Wallace⁴, who reported on the use of magnesium sulphate and morphine synergistically as preoperative treatment for postoperative comfort, the technic is described as "hypodermoclysis of a 4 per cent chemically pure and sterile solution of magnesium sulphate, 200 c.c. given one and one-half hours before operation." In addition, they sometimes gave two or three postoperative injections of 1.5 c.c. of 25 per cent magnesium sulphate plus doses of morphine which, in 11 of their 14 cases, ranged from $\frac{3}{8}$ to 1 grain. That is to say, these patients were given 8 gm. (200 c.c. of 4 per cent solution) of magnesium sulphate before operation, and in some cases approximately 1 gram additional with the morphine after operation.

Magnesium sulphate in obstetric analgesia.—Harrar,⁵ who has reported on the successful employment of rectal analgesia in 5800 cases of labor, describes that part of the technic which applies to the use of magnesium sulphate as follows: "At this time a cleansing soapsuds enema is given, and this is followed by the primary intramuscular injection of $\frac{1}{6}$ or $\frac{1}{4}$ grain of morphine and 2 c.c. of 50 per cent solution of magnesium sulphate deep into the gluteal region. . . . Twenty minutes after the primary morphine and magnesium sulphate injection we give a second intramuscular injection consisting of 2 c.c. of 50 per cent solution of magnesium sulphate alone. This is given no matter whether the effect of the primary injection is sedative or not, as it tends to prolong the action of the morphine. . . . A third intramuscular injection of 2 c.c. of a 50 per cent solution of magnesium sulphate alone is then given immediately [i.e., as soon as the rectal ether-oil instillation is completed] to prolong the action of the ether. . . . When the effect of the first ether instillation is worn off, that is, when the patient again complains of pain which is usually in from two to three hours, a second, or even a third, rectal instillation may be given at intervals of three hours or more. . . . Each subsequent instillation is accompanied with one intramuscular injection of 2 c.c. of 50 per cent solution of magnesium sulphate." That is to say, these patients receive 4 gm. of magnesium sulphate (a 2 c.c. injection of 50 per cent solution, repeated four times) regularly, and if a third ether-oil instillation is needed, an additional 1 gram of magnesium sulphate is injected (2 c.c. of a 50 per cent solution).

SUMMARY

I have made a tabular comparison of the magnesium sulphate dosage in these three conditions in Table I.

TABLE I. MAGNESIUM SULPHATE DOSAGE IN TETANUS, POSTOPERATIVE ANALGESIA AND OBSTETRIC ANALGESIA

REASON FOR MEDICATION	GM. $MgSO_4$ (REGULARLY GIVEN)	GM. $MgSO_4$ (GIVEN IN ADDITION)	OTHER TREATMENT
Tetanus	4		Antitoxin
Postoperative analgesia	8	1	Morphine
Obstetric analgesia	4	1	Quinine, alcohol, ether, olive-oil, morphine

From the foregoing it will be seen that in the preoperative use of magnesium sulphate to ensure postoperative comfort, the patient is regularly given twice as much of the drug as is required to completely control the spasms of a severe case

of tetanus for five hours, and that in the obstetric use of magnesium sulphate the regular dose is equal to that used in tetanus. Is it not little short of absurd to ascribe the good results obtained in these analgesic uses of the drug to its "synergistic" effect upon the morphine? The effect is doubtless an additive one since practically all sedatives do add their effects, but why postulate a synergism? Indeed, I think the time has about come when the term "synergistic analgesia," in so far as it rests upon the alleged synergism of magnesium sulphate and morphine, should be deleted from the permissible terminology of current journals.

REFERENCES

- (1) *Gwathmey, J. T.*: J. A. M. A. 85: 1482, 1925; *ibid* 91: 1774, 1928. (2) *Beckman, H.*: J. Lab. & Clin. Med. 10: 189, 1924; J. A. M. A. 85: 332, 1925; AM. J. OBST. & GYN. 15: 72, 1928; J. Lab. & Clin. Med. (in press). (3) *Smith, C., and Leighton, W. E.*: Am. J. M. Sc. 168: 852, 1924. (4) *Glass, S. J., and Wallace, H. S.*: J. A. M. A. 78: 24, 1922. (5) *Harrar, J. A.*: AM. J. OBST. & GYN. 13: 486, 1927.

HARRY BECKMAN, M.D.

January 25, 1929.

638 FOURTH STREET, MILWAUKEE, WIS.

Albrecht, H.: Marital Fertility and Diminished Birth Rate in Europe, Monatschr. f. Geburtsh. u. Gynäk. 80: 98, 1928.

During the years 1900 and 1901 Germany's birth rate among married women, namely, 286.1 for each 1000 married women under forty-five years of age, was higher than that of most European countries. However, by 1924 it had decreased to 146 per 1000 married women; a point far below that of most of the other European countries. France was the only nation which had a lower birth rate, namely 140.7. The first result of this diminution will be a decrease in population and the second consequence will be an advanced average age for the population. This in turn will increase the number of social problems. A more threatening situation arises from the fact that fewer and fewer children are being born among the higher classes of people.

Other countries also have suffered a reduction in births since the war. England, Sweden, and Luxemburg had 25 per cent fewer births in 1924 than before the war. In the Slavic countries the birth rate is at least 100 per thousand more than it is in Germany, France, or England, but the infant mortality is greater in the Slavic countries than in the others. On the other hand, in the former countries, girls marry at a much younger age, and hence, have longer periods of productivity. In Norway, Finland, and Ireland, the birth rate is low because the young men emigrate from their native lands. In Italy and Spain about 50 per cent more babies per thousand are born than in Germany; in Hungary, and Norway, one-third more; and in Finland and Denmark, one-fourth more.

J. P. GREENHILL.

Department of Maternal Welfare

CONDUCTED BY FRED L. ADAIR, M.D.

MATERNAL MORTALITY AND ITS PREVENTION

This topic was made the subject of discussion at the joint session of the Child Hygiene and Nursing Sections of the American Public Health Association with the American Child Health Association, October 16, 1928, at Chicago, Illinois. Challenged by statements that the United States ranks with those backward nations which have the highest maternal death rates, it was natural that a whole morning's session should be devoted to maternity care at this meeting.

The session produced a careful review, a critical analysis by competent obstetric authorities, and the story of a successful demonstration of safe, sound, and satisfactory maternity care in both urban and rural communities.

The Chairman, Dr. Fred L. Adair, mentioned that it was eighty-five years ago (1843) that Oliver Wendell Holmes and Semmelweis announced the contagiousness of puerperal fever. This disease and the toxemias of pregnancy remain the two major causes of maternal mortality, both theoretically preventable. In addition, maternal mortality with its subsequent disabilities could be largely eliminated. "Obstetrics," Dr. Adair said, "must be practiced on a sane and rational basis by well-trained physicians and nurses in institutions which are designed and equipped for this purpose. All mothers must receive adequate and proper antenatal, intranatal, and postnatal care. In this way alone can the best results be secured for mothers and babies. All other methods or provisions must be considered temporary and inadequate substitutes for complete satisfactory maternity care."

Sweden, the leading country, has about one-third the rate of the United States in maternal mortality and puerperal sepsis. In New York State the mortality from sepsis in the rural sections is less than one-half that in the urban areas.

These startling facts illustrate the contents of the report of the Committee on the Status of Maternal and Infant Mortality from the Child Hygiene Section of the American Public Health Association, which was read by Dr. Julius Levy. The report was divided into three sections:

1. Newer developments in the protection of maternity and infancy during the first year of the committee's existence.
2. A review of relevant statistics of the Bureau of Census, the Children's Bureau and of the State and City Health departments. A number of charts presented graphically the chief significant features of these assembled facts.
3. Two hundred thirty-eight studies or researches were reported in progress in the field of maternal mortality in the hospitals and medical colleges. This committee report was discussed by S. Josephine Baker, M.D.

Higher maternal mortality rate in 1926 than in 1917 is shown in the entire birth registration area, Dr. Blanche M. Haines, U. S. Children's Bureau, reported. The urban death rate for every 10,000 live births was 70 mothers in 1917 and 73.9 in 1926. For the same period the rate in rural districts declined from 62.3 in 1917 to 58.7 in 1926.

Improvement in rural areas, as reported by state directors of maternity and infancy work in states showing greatest improvement, list the following activities as contributing to a lower maternal mortality rate.

1. Educational work—literature, prenatal clinics, nurses' visits, meetings, class groups, and press.

2. Improvement in training physicians in obstetrics in medical colleges, graduate instruction, medical meetings, and the provision of prenatal care.
3. Instruction and supervision of midwives in certain states.
4. Assistance of lay organization of women in promoting educational program.
5. Improved highways.

Increased hospitalization of maternity cases is still an unknown factor.

Further analysis of maternal mortality into specific causes showed: (1) decreased eclampsia, due to prenatal care; (2) decreased sepsis, and (3) an increase in deaths from accidents of pregnancy and labor, possibly due to more operative deliveries.

The second part of Dr. Haines' paper was a progress report on maternal mortality studies in eleven states scattered over the whole country and should give a cross-section of obstetric practices in the whole nation. These studies are planned mostly for two years' duration and should by the end of 1930 furnish data of the factors influencing maternal mortality.

Of 819 maternal deaths in Michigan between April, 1927 and July 1, 1928, 359 were due to septicemia and 167 to toxemias, as reported by Dr. Lillian R. Smith, in discussing Dr. Haines' paper. Abortions were responsible for 231 deaths, of which 206 occurred in married women. Fifty-five per cent of these women had no medical care during pregnancy.

"Obstetrics in the United States is the general practitioner's specialty. It is the nucleus around which the general practitioner builds up a practice, yet it is inadequately taught in practically every medical college of the United States," said Dr. Carl H. Davis, reporting for the Section on Obstetrics, Gynecology and Abdominal Surgery of the American Medical Association. "The health officers of our large cities should investigate the causes of every maternal and infant death," Dr. Davis continued. "If each death was recorded in a special file with the necessary details, valuable information could be secured within a few years. Health officers are the only physicians in a city who can undertake a campaign of publicity." Information which they gather is suitable for presentation before the Section.

"Mortality statistics of the United States show little reduction in the risks of maternity during the last half century," Dr. Davis said in his paper on *Obstetrics at Home and Abroad*. In 1911 Dr. J. Whitridge Williams investigated the obstetric and midwife situation. While some slight improvement has followed, his conclusions apply today. One-half of the answers (to a questionnaire to professors of obstetrics) state that ordinary practitioners lose proportionately as many women from puerperal infection as do midwives, and over three-quarters that more deaths occur each year from operations improperly performed by practitioners than from infection in the hands of midwives.

"At Zurich 1709 babies were delivered in 1926 in one clinic. There were thirteen forceps, two versions, nine craniotomies, and sixty cesarean sections," said Dr. Davis, in reviewing his visit to the clinics in eight European capitals.

"The medical profession has not admitted that maternity care is inadequate," said Dr. Davis, in summing up American conditions. Medical colleges should be the leaders, since they are largely responsible for standards of medical practice, but community cooperation is required to meet the economic need.

"A maternity bill will come before Congress again this winter. Thus far the medical profession has not attempted to correct the situation which caused the Sheppard-Towner legislation. What have we to offer as a substitute?" asks Dr. Davis in concluding. "I believe that this is primarily a community problem which demands cooperation of the medical profession and general public. Physicians should lead the way, otherwise as President Frank, of the University of Wisconsin, pointed out two years ago, some type of state medicine will be forced on us."

"Probably eighty-five per cent of maternal loss of life could be prevented if all women could be cared for in well-organized maternities with competent at-

tendants," said Dr. William C. Danforth, in discussing Dr. Davis' paper. The remedy, he believes, lies in better obstetric education of future generations of doctors and in provision of more adequate hospital care.

Two thousand live babies with no maternal death, was the record turned in by Miss Hazel Corbin of the Maternity Center Association, the work being done in a section of New York City. Deliveries are made by the usual attendant, midwife, doctor or hospital intern, the only difference being the intensive educational and nursing campaign with carefully developed routine technic. This included visits by the nurses to the homes, patients' visits to the center, where nurses and doctors were seen and group instruction was given. At the time of delivery a nurse is sent as soon as labor starts and she stays until mother and baby are cared for and some one is instructed to care for them properly afterwards.

By invitation of the New York State Department of Health, a similar demonstration was put on, beginning in 1925, in Tioga County, a dairy farming county in the southwestern part of the state. The Tioga County Medical Society worked closely with the Maternity Center Association, the doctors referring their cases for care. Several physicians required their patients to register with the nurses. Seventy per cent of the mothers in the county were under care the first year: ninety per cent at the end of three years. The rural work proved easier to establish and somewhat simpler to handle. In December, 1927 the demonstration ended and the work was turned over to a local committee, aided by a regular state subsidy and a county appropriation to finance the service.

"The success of the work in Tioga County depended on three factors: (1) co-operation of the County Medical Society; (2) education of the public; (3) a properly trained nursing staff," said Dr. Guy S. Carpenter, member of the Public Health Committee of Tioga County Medical Society, who came on to discuss this demonstration of rural maternity care. He summarizes the results accomplished as:

1. It was demonstrated that a prenatal and maternity nursing service can be successful in a rural county.

2. A systematic and thorough prenatal and maternity nursing service was rendered to a larger number of mothers than was ever before undertaken in a rural community.

3. Interest in maternity work was stimulated in the medical profession.

4. A permanent nursing service has been established, financed by the county with a state subsidy.

"With such a successful demonstration before them, state health officers need hesitate no longer to put on similar demonstrations in their respective states" said Dr. S. J. Crumrine of the American Child Health Association.

For many years sufficient facts have been known and analyzed to show clearly that the United States has one of the highest maternal death rates and why. This meeting in Chicago in October, 1928, is significant, not only for assembling even more striking facts, including a successful demonstration, but because public and child health authorities have taken up the solution of this problem of human waste.

If eighty-five per cent of the maternal deaths are preventable, as one obstetric authority states, perhaps the time is ripe for action. Judging by accomplishment in other medical fields, an American Safe Motherhood Association, or some such name, would serve to crystallize the latent energy awaiting leadership. Obstetric authorities are prepared to give expert advice. Public health workers are accustomed to organize and promote, and the informed public will furnish financial support.

Thus may this challenge be met and the United States become a place of safe motherhood.

ARTHUR B. EMMONS, II, M.D.
DOVER, MASS.

The Readers' Forum

CONDUCTED BY JOHN OSBORN POLAK, M.D.

Readers of the Journal are urged to avail themselves of the facilities afforded by this department for replies to questions in the domain of obstetrics and gynecology. All inquiries should be directed to Dr. John O. Polak, 20 Livingston Street, Brooklyn, N. Y. Replies to such inquiries will be published as soon as possible in this department.

Is Not Cesarean Section Becoming Too General?

Doctor Charles S. Hickman of Centerville, Iowa, writes us: "Can you give me the general attitude of the medical profession regarding cesarean section? Would one be justified in doing a section because the woman preferred it to labor?"

This query only emphasizes what the effect of the *teachings* of a few of our radical obstetric friends has been upon the profession. Cesarean section is the quickest way to get the baby out, hence, the surgical mechanic without knowledge of the physiology and the art of obstetrics is doing sections on women for almost every conceivable indication without appreciating that abdominal hysterotomy carries with it a greater mortality than that of the average clean abdominal section.

In a study of more than 6000 sections conducted by Doctors Holland, Gordon, Beck and myself, the mortality in clean cases operated upon before labor has begun with the membranes unruptured, or just after the beginning of labor is, approximately 3 per cent. After the membranes have ruptured this mortality rapidly rises to 6 per cent; while after infravaginal interference has been tried and section is subsequently elected the maternal death rate has risen from 10 to 20 per cent, dependent on the amount and the type of infravaginal manipulation. Contrast this with a mortality of 3 or 4 of 1 per cent which are the average mortalities in normal labor and the question is answered, for, as we see it, the conscientious physician or surgeon should always give his patient the best chance for her life.

The indications for cesarean section have been generally broadened in the past few years, because of better prenatal study and more accurate estimation of the relative size of the child to the pelvis. Women who formerly would have been given the full test of labor and operated upon during the second stage are now operated upon early in the first stage and so benefit from a lower surgical risk.

Central placenta previa at or near term after blood transfusion, is well handled by section. Certain breech cases with a large child and early rupture of the membranes afford another indication; while prolapsed cord early in labor with but little cervical dilatation justifies delivery by the abdominal route.

Preeclampsies and cardias where subsequent pregnancy is a menace to the woman's future health, admit of section and sterilization (under local anesthesia).

Primarily, section is done in the interest of the child, always accepting the fact that the woman's risk is increased by section in all relative indications—hence, it would not only be a stretch of the physician's conscience, but a stretch of his veracity and his honesty to his patient to advise section versus normal labor, just because this is the easiest way to get the baby out without pain.

J. OSBORN POLAK, M.D.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

The Obstetric Literature of 1928

BY J. P. GREENHILL, B.S., M.D., F.A.C.S., CHICAGO, ILL.

(Attending Obstetrician, The Chicago Lying-In Hospital and Dispensary; Attending Gynecologist, Cook County Hospital; Associate in Obstetrics, Northwestern University Medical School)

THIS year's review contains a few really new ideas in obstetrics such as the hormone tests of early pregnancy, a new treatment of pyelitis, a new drug for the induction of labor, and the performance of Porro cesarean sections under direct infiltration anesthesia. The old but nevertheless important problems in obstetrics are discussed as in previous reviews.

PREGNANCY

Physiology.—An investigation was made by Gragert¹ of the various chemical laboratory methods for the diagnosis of early pregnancy. He used the phloridzin, the ninhydrin flocculation, the antithrombin, and the alcohol extract reactions, and he concludes that as yet the chemical methods for the early determination of pregnancy are too inaccurate. On the other hand, the hormone test devised by Aschheim and Zondek² was positive in 77 out of 78 pregnant women and positive in only 3 out of 236 nonpregnant controls. The test consists of injecting 1 to 2 c.c. of the morning urine of pregnant women into young mice and noting the effect on the ovaries. In pregnancy the urine contains a large amount of hormone of the anterior lobe of the pituitary gland and the hormone has a distinct effect on the ovaries of young mice. Louria and Rosenzweig³ carried out the Aschheim-Zondek test in 87 pregnant women and found the test positive in 98 per cent. (This test permits an accurate diagnosis of pregnancy long before the physical examination is conclusive.) Siddall⁴ used gravid blood serum for the same purpose and studied the effect on the uterus and ovaries of mice. Miller and Martinez⁵ injected iodized oil into 15 uteri to detect pregnancy and while a correct diagnosis was made in every case, three patients aborted. Hence, this method is dangerous and unjustified. Albano⁶ injected tetro-thalein intravenously into women and when x-ray pictures were taken of the pelvis, pregnancy was revealed whenever present.

A very thorough review of all the important studies on calcium in the mother, the fetus, and the placenta is reported by Vignes.⁷ He especially discusses the dangers of decalcification and of an excess of calcium. Schönig's⁸ studies lead him to believe that the maternal blood calcium is diminished from the sixth month of pregnancy to term. This is not due to withdrawal of maternal calcium by the fetus but to deviation of the calcium into other channels. (The indiscrimi-

nate administration of calcium to all pregnant women regardless of necessity, or the use of ultra violet lamps to increase calcium metabolism, should be deprecated. The normal diet of a pregnant woman usually contains enough calcium for both mother and fetus.)

Frank and Goldberger⁹ point out that the female sex hormone is found in the circulating blood from the twelfth to the fortieth week of gestation and that death of a fetus after the twelfth week can be recognized by their test. By the injection of insulin Vogt¹⁰ not only produced sterility in rabbits but altered the female sex cells in such a way that after subsidence of the sterility, the offspring were almost entirely females. Fellner¹¹ obtained the same results by injecting feminin, a sex hormone. Vogt believes his experiments confirm the rule that animals which give birth to a number of young at one time, produce especially females in time of distress. Uhlmann¹² injected ovarian hormone into rabbits, permitted them to mate and found an overwhelming number of females in the litters.

To verify Hofbauer's work on the histologic changes in the parametrium during pregnancy, Rossinski¹³ studied the parametria of pregnant rabbits, and of pregnant women who had died by accident and in whom infection could be ruled out. He concludes that while the parametrium undergoes changes in pregnancy similar to the vagina, the picture of phagocytic stimuli described by Hofbauer as a concomitant of every pregnancy is actually explained by trauma to the uterus.

Hartman¹⁴ gives a vivid and interesting description of parturition in the monkey with data on the gestation period and other phenomena incident to pregnancy and labor. The monkey gives birth in the sitting or squatting position, a posture still assumed by a large portion of the human race. Jolly¹⁵ presents evidence to show that the period of human gestation is intimately related to the length of the mother's menstrual cycle. He believes the physiologic period of gestation extends over eleven cycles and not ten as currently assumed.

A simplification of the Thoms method of Roentgen pelvimetry is reported by Heublein, Roberts, and Ogden¹⁶ and a pelvimeter for the direct measurement of the true obstetric conjugate is described by Smith.¹⁷ On the other hand, H. Baumm¹⁸ maintains that most obstetricians have long ago ceased to attribute great importance to pelvic measurements obtained with a pelvimeter. He advocates external measurement of the pelvis by means of the hands after the method of P. Baumm. (As Baumm says, mensuration with a pelvimeter has been given up by many physicians. This is probably due to the fact that in previous years great pains were taken to obtain very exact measurements and too much reliance was placed upon them. After all, the fetal head is the best pelvimeter because its dimensions determine whether or not a pelvis is contracted. Nevertheless pelvic mensuration is of distinct value. It is a serious mistake not to measure carefully a patient's pelvis when she is first seen but to rely upon a test of labor before plans are made for the necessary treatment. The only safe and scientific procedure is to examine and measure the pelvis of every pregnant woman, so that all available information will be obtained before labor sets in. The Thoms method is helpful.)

Abortion.—The treatment of incomplete early abortion is discussed by Novak.¹⁹ He advocates expectant treatment in febrile cases until several days after complete defervescence. Clauberg²⁰ and Burch²¹ likewise recommend conservative therapy for febrile abortions. Gelhorn²²

favors strict conservatism if there are definite complications outside the uterus but if a second examination reveals no complications or tenderness outside the uterus, he uses the sharp curet irrespective of fever. Mgalobeli²³ too favors early emptying of the uterus in cases of febrile abortion unless the infection has spread beyond the uterus. Benthin²⁴ maintains that conservative treatment of febrile abortion is the best but he advocates the insertion of charcoal sticks into the uterus in these cases. (There is no unanimity of opinion concerning the proper treatment of febrile abortion but the number of those who prefer conservatism is increasing constantly. Very good results are obtained by building up the patient's resistance with fresh air, sunlight, nourishing food, tonics, blood transfusion, etc. The uterus can generally be emptied by the administration of quinine orally and pituitary preparations hypodermically. Elevation of the head of the bed favors drainage. After the temperature has been normal for at least five days it is relatively safe to invade the uterine cavity. The sedimentation test and the leucocyte count are helpful laboratory tests. If bleeding demands treatment during the febrile period, a pack usually suffices and the pack should be saturated with a liberal amount of mercurochrome or hexylresorcinol. The presence of pus necessitates surgical drainage.)

Kallinikoff²⁵ reports a series of 1000 induced abortions and describes his technic. (The author lives in Russia where any woman applying for an abortion can have it done but it must be performed by a licensed physician in a public hospital.) Vogel²⁶ studied Russian statistics to determine the effect of abortions on fertility, and he came to the conclusion that the number of births is the same whether women have labors only, or labors and abortions. Furthermore, the incidence of secondary sterility is greater in women who had labors alone than in those who had both labors and abortions. (This article is not clear and the author himself admits that his conclusions do not harmonize with the fact that artificial abortion is a harmful procedure. There is no doubt that criminal abortion much more frequently than full-term labor tends to cause disturbances in later pregnancies and labors.)

During the past year the German literature contained a relatively large number of reports of gangrene of the extremities following abortion or full-term labor. For example, there are reports by Kienlin,²⁷ Brandess,²⁸ Spiegel,²⁹ Goldberger,³⁰ Lork³¹ (2 cases), Schmidt³² (3 cases), and Neumann³³ (4 cases). (In most of these cases, the cause seemed to have been gynergen, an ergot preparation.) Zweifel³⁴ collected 30 cases of puerperal gangrene in which no amputation was performed and all the patients died. He contrasted these cases with a series of 24 patients on whom amputation was performed and 18 survived.

Bland³⁵ is of the opinion that one patient out of every 8 or 10 who had a hydatid mole dies, either as the direct result of the associated hemorrhage or, indirectly, from chorioepithelioma. He reports a series of 10 patients with hydatid mole, six of whom subsequently developed a chorioepithelioma. (The incidence of malignancy in Bland's series is unusually high; for if large numbers of cases of hydatid mole are collected it will be found that the incidence of the subsequent development of chorioepithelioma is not more than 2 or 3 per cent. For this reason Bland's first statement is too pessimistic.)

Complications.—The gall bladder function of 46 pregnant women was studied by Benda³⁶ and in not one case was a gall bladder disturbance found. A similar study was made by Levyn, Beck and Aaron³⁷ who conclude that biliary tract disease in pregnant women is of metabolic origin rather than due to the effect of mechanical pressure. Crossen and Moore³⁸ are of the opinion that cholecystography is valuable in the early months of pregnancy but not in the later months. They believe that cholelithiasis and cholecystitis in women who have children are to be attributed to puerperal infection which might be so mild as to escape attention. Ferguson and Priestley³⁹ believe that the hypercholesterolemia which is normal during pregnancy, predisposes to the formation of gallstones.

The subject of the heart in pregnancy is fully discussed by Frey and Lardi.⁴⁰ In a series of 74 cases, 12 were treated in the early months by abdominal hysterotomy and sterilization under local anesthesia, 43 delivered spontaneously at term and 19 were delivered by the low, cervical cesarean section under local anesthesia. All of the patients recovered. Hamilton and Kellogg⁴¹ give a brief outline of the principal points in heart disease during pregnancy. They believe the easiest way to deliver a patient with a cardiac affliction is by cesarean section and they prefer ether as the anesthetic. Gammeltoft⁴² reports his extensive studies of cardiac patients during pregnancy. (The reviewer is of the opinion that every patient with heart disease who becomes pregnant should be under the care of a heart specialist throughout pregnancy, labor, and the puerperium. Direct infiltration anesthesia with the aid of morphine or pantopon should be used where possible, especially for episiotomy and cesarean section. Most primiparas and many multiparas who have pronounced signs of heart disease should be delivered by the low, cervical cesarean section.)

An excellent paper on syphilis and pregnancy is presented by Gammeltoft⁴³ who believes that every syphilitic woman should be treated during pregnancy with salvarsan and mercury or bismuth without any regard to the date of the initial infection, to a previous intensive treatment and to a negative Wassermann reaction. Philipp⁴⁴ believes that Colles' law is true. Briefly stated the law maintains that a congenitally syphilitic child cannot infect its own mother but can give syphilis to another individual. (Today we know that every mother of a syphilitic child has syphilis.) Profeta's law which maintains that a syphilitic mother cannot infect her healthy child, is not always true. The value of various blood tests for syphilis in pregnancy is discussed by Peltret,⁴⁵ Stillians,⁴⁶ Lafont and Mèle,⁴⁷ Trillat and Rousset,⁴⁸ and Chappaz.⁴⁹ The general consensus of opinion is that the usual blood tests have the same diagnostic value in pregnant as in nonpregnant women.

It is emphasized by Yoakam⁵⁰ that pregnancy causes increased demands upon thyroid function and when the diet is deficient in iodine, it leads to hyperplasia of the gland, hyperthyroidism and congenital goiter in the newborn. The author makes a plea for the use of iodine salt throughout pregnancy. This is a valuable recommendation.

Mathieu⁵¹ reviews some literature on the subject of pulmonary tuberculosis and pregnancy. Gellhorn⁵² points out that therapeutic abortion for pulmonary tuberculosis is of value only in the first three months of pregnancy, and the method he advocates is anterior hysterotomy under local anesthesia. Even at the time of labor inhala-

tion narcosis should be avoided. (The reviewer agrees that in pulmonary tuberculosis as well as in heart disease, the toxemias of pregnancy and other serious complications, local anesthesia should be used wherever possible.)

It is the opinion of Levy-Solal, Laudat and Wolff⁵³ that a permanent glycosuria during pregnancy should always arouse the suspicion of diabetes and calls for a study of the blood sugar both before and after labor. Walker⁵⁴ believes that if a pregnant diabetic woman is treated with insulin and properly dieted there is no ground for terminating pregnancy because a live child will be born and the diabetic condition will not be aggravated by the pregnancy. (Walker is a little too optimistic because occasionally insulin is not successful.)

Karg⁵⁵ collected from the literature 6 cases in which pregnancy followed the occurrence of carcinoma of the cervix and 10 cases where pregnancy occurred in the presence of carcinoma of the cervix and he adds two more of the latter. All 18 patients were treated with radium. In 12 cases there was a spontaneous delivery and all the children were normal. The author believes that cancer of the uterus during pregnancy should be treated with radium because it not only preserves the life of the mother but also saves the baby. (Radiation will most likely replace the older and more dangerous procedures such as the Porro operation and panhysterectomy.)

The influence of fibroids on pregnancy and labor is thoroughly discussed by Polak⁵⁶ who emphasizes that there is a distinct incompatibility between pregnancy and fibroids. Nevertheless, women with uterine myomas go through pregnancy with but little difficulty.

Waldstein⁵⁷ reviewed the literature on the association of epilepsy and pregnancy. Among 23 patients there were 54 pregnancies, of which 40 went to term, 5 ended prematurely, and 9 terminated as abortions. Gestation did not make the epileptic condition worse, for in half the cases there was an actual improvement. Campbell⁵⁸ analyzed the cases of chorea gravidarum which have been reported in literature, and he believes that all the cases have an infectious origin, and that the accompanying lesions in the endocardium and joints have the same etiology. Conservative therapy is sufficient for the mild and moderately severe cases but in the very severe cases, pregnancy must be terminated. Roques⁵⁹ reviewed the literature on the association of epidemic encephalitis with pregnancy, labor, and the puerperium. He found that in general there is a close correspondence in symptomatology between gravid and nongravid women. Labor in some cases causes a marked change for the worse while in others improvement follows delivery.

The Toxemias.—It is the opinion of Gardiner⁶⁰ that vomiting of pregnancy is due to the upright position of the human being and that the inverted ventral posture and sedatives will cure hyperemesis. He also believes that enteroclysis is a safer and more rational guide to the amount of fluid needed than intravenous administration or hypodermoclysis. Speidel,⁶¹ however, favors subcutaneous and intravenous administration of fluids and Péry⁶² advocates the use of insulin for these cases. On the other hand, Titus and Dodds⁶³ maintain that insulin with glucose is of questionable value but insulin without glucose is dangerous. Studies of the latter authors indicate that there are low blood-sugar values in hyperemesis just as there are in eclampsia. This finding supplies a scientific basis for the success of glucose adminis-

tration in cases of pernicious vomiting. (As Titus and Dodds insist, insulin may be dangerous for patients with hyperemesis. If used at all, careful and repeated blood-sugar studies should be made. Large amounts of fluid, glucose without insulin, isolation and sedatives are usually sufficient to cure excessive vomiting of pregnancy. Of great assistance in the treatment is suggestion and occasionally also duodenal tube feeding.)

Ivens⁶⁴ draws attention to the association of latent autogenous infection with the albuminuria of pregnancy. The organisms responsible can be found in the urine. (DeLee⁶⁵ was the first to call attention to the close association of the toxemias of pregnancy and ureteropyelitis.) Kahn⁶⁶ advocates the routine catheterization of both ureters in all cases of pregnancy toxemia or arterial hypertension without symptoms of toxemia. (This procedure as a routine is too radical and unnecessary.)

Mussey and Keith⁶⁷ believe that most pregnant women with acute nephritis recover with little or no demonstrable impairment of renal function and that many women with a history of nephritis but with no gross impairment of renal function can be carried safely through pregnancy under careful supervision. They believe that many patients who have a low grade chronic nephritis or hypertension have more than sufficient renal and vascular function to carry a pregnancy to term. (This is opposed to the general opinion that patients with nephritis should not be permitted to become pregnant or to carry a pregnancy to term. It is very difficult to manage a nephritic pregnant woman so that her condition will not be aggravated and the child will not die in utero before term. Placental pathology such as hemorrhages, gross infarction and abruptio placentae is hard to prevent.)

A long series of painstaking investigations have proved to Titus, Dodds, and Willetts⁶⁸ that contrary to the opinion of many, there is a sudden drop in the blood-sugar content just before an eclamptic convulsion. Their work also verifies the fact that in eclampsia there is a disturbance in carbohydrate metabolism. Hence, the proper treatment for eclampsia is intravenous injections of hypertonic glucose solutions (without insulin) and complete muscular rest. However, Loeser⁶⁹ believes insulin is of value in cases of eclampsia as well as in hyperemesis. (Insulin is unnecessary in the treatment of eclampsia.)

Krieger⁷⁰ emphasizes that fever is frequently present in eclampsia, and he believes it to be of central origin due to cerebral pressure. The fever runs parallel with the cerebral pressure symptoms; hence, a sudden rise in temperature is nearly always accompanied by cerebral paralysis. Laffont and Jahier⁷¹ believe that among the natives of North Africa syphilis is the cause of eclampsia because they found a large incidence of lues among the patients with eclampsia. (This is very poor logic and still poorer scientific acumen.)

In a discussion of the treatment of the toxemias of pregnancy Polak⁷² favors medicinal therapy. Clason⁷³ also advocates medical treatment but interrupts pregnancy if the symptoms become worse in spite of the treatment. Except in the fulminating cases conservative treatment is Falls⁷⁴ method of choice. He advocates cesarean section in rapidly advancing toxemias when proper facilities are available. Basing his opinion upon a study of 449 cases of eclampsia which occurred in the three Viennese obstetric clinics, Herrmann⁷⁵ favors early and quick delivery of all eclamptic patients who can be delivered easily by

the natural passages. Old primiparas and multiparas with undilated soft parts near term should be delivered by cesarean section. (In certain large clinics eclampsia is becoming a rare disease. However, the fact that 5,000 women die from eclampsia every year in the United States means that at least 25,000 women have eclampsia and pre-eclampsia. This is a lamentable fact because eclampsia can be almost entirely prevented by proper prenatal care. Patients with severe toxemias should be treated in a hospital but if a patient must be cared for at home, the most conservative methods will yield the best results. In a hospital an experienced individual will obtain the best results by treating patients individually but not hesitating to empty the uterus in the most conservative way in a large proportion of the cases. Of the greatest importance is the avoidance of a general anesthetic. Episiotomy, forceps delivery, and cesarean section can all be performed under local anesthesia with great ease.)

According to Duncan and Seng⁷⁶ physiologic forces external to the ureters cause an obstruction to ureteral and renal drainage in pregnancy which is relieved almost immediately upon the termination of pregnancy. Kamniker⁷⁷ maintains that delay in emptying of the renal pelvis begins in the first half of pregnancy at the time when there is no stasis and no ureteral dilatation is visible. The delay is most marked in cases of pyelitis. Hofbauer⁷⁸ believes that urinary obstruction in pregnant women is caused by certain anatomic conditions in the juxtavesical portion of the ureter and in the trigonum vesicae. While there occurs after labor a gradual return of the renal pelvis and of the ureter to normal in uncomplicated cases, persistence of both bacteria and marked dilatation of the ureter was demonstrable on reexamination in a considerable percentage of women who had been treated for pyelitis during a preceding pregnancy. The use of pituitary preparations is suggested by Hofbauer on account of their specific antiphlogistic action as well as because of their stimulating effect upon ureteric peristalsis. (In the few cases of pyelitis which the reviewer has treated with pituitrin the results have been encouraging.) Experiments of Hofbauer and Timbres⁷⁹ tend to show that the depressing effect of bile salts on ureteral contractions may be an important factor in the atonic condition of the ureters in pregnant women and that minute doses of adrenalin have a stimulating effect on the ureters.

LABOR

General.—According to Knaus⁸⁰ the onset of labor is due to two factors; namely, increase in contractility and tonus of the uterine muscle during pregnancy and to degeneration of the corpus luteum with its release of the uterine musculature for the complete working of the hormone of the posterior lobe of the hypophysis. Normally both factors are equally active at the onset of labor but in abnormal cases either one may stimulate the onset of labor pains alone. Hofbauer⁸¹ believes that the bile salts play a rôle in the causation of labor.

Wittenbeck,⁸² Hatzky⁸³ and Calmann⁸⁴ favor the induction of labor by means of pituitary extract, while Wigger⁸⁵ praises inhalation of carbon dioxide for this purpose. Temesvary,⁸⁶ the first to use thymophysin which is a combination of pituitary and thymus extracts, praises

this new preparation and so does Liebe.⁸⁷ (Pituitary preparations should be used with great caution toward the end of pregnancy and especially during labor.)

Hoehne⁸⁸ reports the case of a pregnant woman who manifested an idiosyncrasy toward quinine which lasted for five weeks after labor. The child was normal. (A number of instances have been reported where quinine most likely caused fetal death.)

In a very interesting and timely paper on long labor, Bailey⁸⁹ discusses acidosis during labor. He emphasizes that blood pressure readings and where possible checking of the CO_2 will confirm the clinical diagnosis of acidosis. No anesthesia should be given and no operation performed until the blood pressure is 100 or over. This will lead to a diminution of the sudden and obscure deaths that occur at the end of long labors.

Potter⁹⁰ advocates immediate repair of birth canal injuries following deliveries. He not only repairs fresh lacerations but also cuts away any diseased tissue or scar tissue that may be present. Danforth⁹¹ likewise points out the benefits of immediate repair of the cervix after labor. He emphasizes that it is just as logical to repair cervical injuries as perineal lacerations. (The reviewer agrees with Potter and Danforth that every cervical laceration more than 1 cm. in length should be repaired immediately after the placenta is expressed. This means routine exposure of the cervix and for this purpose clean surroundings, good light, assistants and proper instruments are necessary. In the home cervical repair is not advisable except for hemorrhage and even then it may be quicker and safer to pack the uterovaginal tract.)

Analgesia and Anesthesia.—Beckman⁹² reiterates his belief that the alleged synergism of magnesium sulphate and morphine does not occur in the dog and that no satisfactory evidence has been brought forward to show that this synergism occurs in man. Gwathmey,⁹³ on the other hand, maintains that the synergism of magnesium sulphate and morphine has been definitely proved clinically, the value of morphine being increased from 250 to 500 per cent. Lynch's⁹⁴ choice of anesthetic for obstetric cases is nitrous oxide. He does not use morphine, ether, or ethylene for cesarean sections and he employs local anesthetics only for a definite indication, because he considers it brutal. (The reviewer performs practically all of his cesarean sections and even some Porro operations and gynecologic operations under direct infiltration anesthesia and is firmly convinced that local anesthesia, if properly administered, is far from brutal. Morphine and scopolamin are given immediately after the child is born by cesarean section and few women complain of pain. Some patients are half asleep before the operation is ended.)

The German literature contains a number of articles on the use of pernokton to produce twilight sleep. This drug is a combination of a bromide and barbituric acid and is praised by Roettger⁹⁵ and by Vogt⁹⁶ but is looked upon with disfavor by Gauss,⁹⁷ Pankow,⁹⁸ G. Doederlein,⁹⁹ Zweifel,¹⁰⁰ Rupp,¹⁰¹ and Muetz.¹⁰² According to Rupp at least the bromine derivative is transmitted to the fetus. (Recently Kobes¹⁰³ has shown that both the bromine and the barbituric acid are transmitted to the fetus in appreciable amounts and according to Pankow all the babies at birth are ash gray in color.)

Katz¹⁰⁴ reviews 27 deaths from narcotics during pregnancy and labor. Of the 9 deaths during pregnancy, 7 followed the use of chloroform, 1 chloroethyl, and 1 ether. Nine of the 18 deaths during labor followed chloroform and 9 followed ether. During pregnancy status thymico-lymphaticus plays a rôle but in labor the important factors are toxemia and infection, especially pyelitis. (This is another argument for using local anesthesia, wherever possible, especially in cases of toxemia and infection.)

Complications.—In cases where fever is present during labor, Siebert¹⁰⁵ maintains that shortening the labor by operative procedures is always done at the expense of puerperal morbidity. Operative delivery is indicated only when progress has ceased. (This is essentially correct because the duration of labor in uncomplicated febrile cases usually has no influence on the course of the puerperium. If, however, the labor can be terminated by simple measures this should be done.)

Mayer¹⁰⁶ discusses retrodeviation of the cervix during labor. He emphasizes that it is usually the result of a long, anterior wall of the lower uterine segment and advises that when the condition is recognized the external os be centralized by being pulled forward with a finger. (Displacement of the external os far back in the pelvic cavity is not uncommon and should be corrected early.) Mathieu and Schaufli¹⁰⁷ studied the rigid and stenosed cervix during the first stage of labor and they maintain there is no such thing as spasmodic or functional rigidity of the cervix. (In 1922 the reviewer¹⁰⁸ reported a case of true spasm of the external os. Mathieu and Schaufli refer to this case but say they cannot explain it.) The authors also discuss the treatment of cervical dystocia.

Falls¹⁰⁹ calls attention to certain signs and symptoms that seem to be characteristic of cases of bicornate uteri and points out the possible dangers to the mother and fetus. Vidal¹¹⁰ reports a case of maternal tachycardia and arrhythmia following an injection of pituitary extract during labor. (We have seen a few cases of shock after pituitrin.)

Küstner¹¹¹ takes up the question of uterine rupture after previous cesarean section. He points out that all the reports indicate that spontaneous ruptures followed previous injury to the body of the uterus. (This is one of the reasons for the superiority of the cervical cesarean section.) Küstner believes that at least one year should elapse after cesarean section before a new conception takes place. Engels¹¹² reports a case of a woman who had two uterine ruptures after a cesarean section and Cohen¹¹³ reports the seventh case in the literature of rupture of the uterus produced by the Credé manipulation. Abraham¹¹⁴ discusses spontaneous rupture of the uterus and says that a number of authors failed to find scar tissue in uteri which had been subjected to injury including cesarean section. (Greenhill and Bloom¹¹⁵ microscopically studied 37 pieces of tissue removed at the time of a repeated cervical cesarean section from the site of the former operation and found scar tissue in all but six specimens.)

Operations.—DeLee¹¹⁶ discusses fully the treatment of occiput posterior position after engagement of the head. (This article should be carefully read by all because more babies are lost as the result of this position than from any other one cause.) McNally¹¹⁷ praises the Kiel-land forceps for internal rotation of the head and Schwenke¹¹⁸ believes

the use of these forceps should be taught even to general practitioners. (The Kielland forceps are useful only occasionally and they should be used only by a skilled obstetrician for they may do much harm.) Barton, Caldwell and Studdiford¹¹⁹ extol the Barton forceps. (These forceps also are for the trained specialist and they likewise are better than the usual forceps only occasionally. After all, an experienced obstetrician can perform with the forceps to which he is accustomed, almost everything which is claimed by the advocates of new instruments. Furthermore, version and extraction must not be forgotten, because not infrequently these operations are much simpler and safer than a forceps delivery on a high head.)

The application of a special forceps to a breech is advocated by Framm¹²⁰ while Küstner¹²¹ has devised a hook for the delivery of the breech. (The reviewer has never found it necessary to apply forceps or a hook to a breech.)

The value of routine external cephalic version in uncomplicated breech presentations is emphasized by McGuinness,¹²² while Hertzler¹²³ makes a plea for elective podalic version when there is more or less complete dilatation of the cervix. (Routine podalic version especially in the hands of the unskilled, is responsible for the loss of many newborn babies and for a large maternal morbidity. However, we must be grateful to Potter¹²⁴ for recalling that version [and extraction] is very helpful in many complications of labor and for the development of a skillful technic of performing this operation.)

Ponomaroff¹²⁵ reviews all the cesarean sections performed in Russia from 1756 to 1924, and Gordon¹²⁶ analyzes 934 cesarean sections performed in Brooklyn. The maternal mortality for the latter series was 5.8 per cent and the cervical cesarean section yielded better results than the classic operation. Stein and Levinthal¹²⁷ report 40 consecutive cervical operations without a maternal death and Danforth and Grier¹²⁸ report 50 of these operations without mortality. In cases where the bladder peritoneum could not be used to cover the uterine incision Aschner¹²⁹ employed the round ligaments for this purpose. DeLee, Nadelhoffer, and Greenhill¹³⁰ report a series of 91 repeated laparotomies. The total mortality was 2.2 per cent and local anesthesia was used in 60 per cent of all the cases.

Frey¹³¹ extols the use of local anesthesia for abdominal cesarean section and claims that the only contraindication is eclampsia. (The reviewer believes that preeclampsia and eclampsia are two of the most important indications for local anesthesia. As Stander¹³² has shown, all inhalation anesthetics produce toxic disturbances similar to those caused by the toxemias of pregnancy. Hence, the use of inhalation anesthesia in toxemic patients increases the toxemia. Furthermore, one of the most frequent causes of death in eclamptic patients is pneumonia and this complication can be avoided almost entirely by using local anesthesia.) Not only can cesarean sections be performed under local anesthesia but also Porro operations as the four cases reported by Greenhill¹³³ indicate.

Phaneuf¹³⁴ points out the indications for vaginal cesarean section and Groene¹³⁵ reports a series of 116 of these operations. Delmas¹³⁶ advocates forcible dilatation of the cervix at the end of pregnancy in selected cases. He administers spinal anesthesia, manually dilates the cervix and performs version and extraction or applies forceps. The

entire operation lasts only about fifteen minutes and dilatation of the cervix usually requires only about three minutes. (This return to accouchement forcé which we hoped had fallen into well-deserved desuetude, is unfortunate. Great harm can result from widespread use of this procedure even in the hands of specialists.)

Uterine Hemorrhage.—Schroöder¹³⁷ advocates the use of pituitary preparations in cases of atony and hemorrhage before the placenta is expelled and routinely after the placenta is out of the uterus. (We administer pituitrin intramuscularly almost routinely after delivery of the child and have observed only an occasional bad result. The pituitrin should be given immediately after the baby is born for if a few minutes are permitted to elapse, the placenta after separation, may be retained in the uterine cavity by a spasm of the internal os.)

Ward, Lyon, and Bemis¹³⁸ compared the results of oxytocin and pituitary extract and found that there appeared to be a slight difference in favor of oxytocin as regards the oxytocic action. The latter drug does not raise the blood pressure as pituitary extract does, hence, it is desirable in cases with high blood pressure.

In cases of hemorrhage due to cervical laceration and incomplete rupture of the uterus, Zangemeister¹³⁹ maintains, the proper treatment is firm packing of the rent and not suture. (It is much safer to suture torn blood vessels and bleeding cervical tissue than to trust to packing. If, however, the facilities are not at hand, such as clean surroundings, an assistant, long retractors, and good light, one must rely upon tamponade assisted by compression from above.)

Füth¹⁴⁰ reviews 606 cases of placenta previa cared for by midwives and the mortality was 14 per cent. In the 64 cases reported by Douglass and Siegel¹⁴¹ the mortality was 20.3 per cent.

C. J. Miller¹⁴² discusses the hemorrhagic complications of the later months of pregnancy and he believes that cesarean section is indicated in very few cases of placenta previa. On the other hand, Henkel¹⁴³ says that abdominal operation is the method of choice in the majority of cases. Martin¹⁴⁴ praises vaginal cesarean section because he lost only two mothers in the last 120 cases treated by this method. Essen-Moeller¹⁴⁵ believe that vaginal cesarean section is only occasionally necessary in cases of placenta previa. (The reviewer believes that all patients with placenta previa should be sent to a hospital. Most patients who have central or partial placenta previa, and who have lost much blood, should be delivered by the cervical cesarean section under local anesthesia, regardless of the condition of the child. A blood transfusion should be given before, during, or after the operation. If a patient must be treated at home, tight packing of the vagina with cotton pledgets followed by Braxton Hicks version is probably the best procedure. The delivery of the child should be left to the natural forces of labor, else great damage may result from forcible extraction.)

A review of 94 cases of abruptio placentae is reported by Goethals,¹⁴⁶ while Kellogg, Taylor, Eades and Weller¹⁴⁷ discuss this condition with special reference to the kidney in these cases. Contrary to the general opinion that accidental hemorrhage is due to toxemia, Paramore¹⁴⁸ believes that all the consequences of abruptio placentae are due to the bleeding which results from rupture of placental sinuses. Jarcho¹⁴⁹ favors the Mojon-Gabaston injection method of separating the placenta where skilled assistants are not available and asepsis is not perfect.

Sachs¹⁵⁰ recommends that traction on the cord be made at the same time that a Credé expression is attempted before removing a placenta manually. Aschermann¹⁵¹ advocates removal of the placenta in cases of placenta accreta by means of traction on the cord, while Zange-meister¹⁵² condemns this method in no uncertain terms. (There is great danger if traction is made on the cord while the placenta is still attached to the uterus. There is no harm in pulling on the cord if the placenta has been expelled from the uterus and is lying in the vagina; but one must be sure of this before making traction. As a general rule it is best never to pull on the cord except very gently.)

Nathanson¹⁵³ discusses the anatomy, genesis and clinical considerations of placenta accreta and Klawns¹⁵⁴ reports the only case of placenta accreta which recurred in 70,000 labors in the first Woman's Clinic in Vienna. In the literature are reports of 21 operated cases with a mortality of 14.3 per cent, and 24 unoperated cases with a death rate of 87.5 per cent.

PUERPERIUM

General.—Very interesting researches on lactation were carried out by Lowenfeld and Widdows,¹⁵⁵ and also by Harding, Murphy, and Downs.¹⁵⁶ A new test for lactosuria in nursing women is described by Castellani.¹⁵⁷ Thyroid tablets are advocated by Kraul¹⁵⁸ for patients in whom the flow of milk is not free.

Nelson and Pattee¹⁵⁹ examined a number of ergot preparations available in the market and found that only the U.S.P. fluid extracts contain important amounts of the active alkaloids. The ampoules of ergot seem to be wholly devoid of activity. (The ampoules of ergot are not only unnecessary because they are usually inactive, but they not infrequently are the cause of abscesses. We have not used the ampoules in our work for a long time and our results are certainly just as good as when we did use them.)

Sepsis.—Young¹⁶⁰ discusses the maternal mortality from puerperal sepsis in Great Britain, and he emphasizes that trauma is the most important cause of the deaths from sepsis. Findley¹⁶¹ has written an excellent article on puerperal infection and he gives valuable information on how we can improve our results. (However, Findley repeats the statement that we rank highest in maternal mortality and morbidity among 21 leading nations of the world. The reviewer last year pointed out the basis for this fallacious statement, the incorrectness of which is recognized by the Health Section of the League of Nations. The reviewer would like to mention at the present time that Bourne,¹⁶² an Englishman, in his recent book publishes a list of nations and their maternal mortality. The United States is listed as having the highest maternal death rate, but the author points out that if England collected its maternal statistics as did Scotland, England's mortality rate would be higher than that of the United States. If England and Scotland, both constituents of the British Empire and geographically close, differ in their methods of collecting maternal mortality statistics, how much difference is there in countries of different nationalities, geographical limits, temperament, etc. Bourne himself says, "It is not possible to make a close comparison between this country [England] and the United States of America, owing to great variations in administration in various areas." There is no doubt whatever that the maternal mortality in the United States can be very considerably reduced, but it is not greater than it is in other countries.)

Harris and Brown¹⁶³ cultured 50 uteri at cesarean section and found that 22 were infected. With one exception the puerperium of these patients was febrile, but all recovered. The same authors¹⁶⁴ studied 113 cases of streptococcic puerperal infection and they believe that viable streptococci do not remain in the uterine cavity until the fifth day of the normal puerperium without giving rise to clinical manifestations of infection. Bryce¹⁶⁵ feels that it is fallacious to regard the presence in the genital passages of streptococci without reference to their biologic character and consideration of clinical features, as evidence that they are causally related to any disease which may exist. Sommer¹⁶⁶ maintains that not only hemolytic streptococci but also every pathogenic organism can cause grave puerperal sepsis. Goodall and Wiseman¹⁶⁷ point out the importance of cervical infections in the puerperium and the train of signs and symptoms which follow these infections. They put forth an ardent plea for active treatment of every form of endocervicitis by cautery and amputation.

Two of the outstanding articles of the year are the contributions of Watson,¹⁶⁸ and Meleney, Zaytezeff and Harvey¹⁶⁹ on the outbreak of puerperal sepsis in the Sloane Hospital in New York City. Watson reports the clinical features of the epidemic while Meleney and his coworkers discuss the epidemiology and bacteriology. (The recommendations made for the prevention of sepsis are most valuable, especially the one concerning the masking of the mouth *and nose* by all in attendance on a parturient or puerperal woman. These papers can be reread once a year with great profit because the lessons they teach are fundamental in obstetrics.) Allan and Bryce¹⁷⁰ report a similar but smaller epidemic of septic infection which occurred in Melbourne.

Watson¹⁷¹ discusses puerperal infection in general and emphasizes that the majority of all infections come from without but the portal of entry may not always be the external genital tract. He favors conservative treatment. Bonney¹⁷² in a discussion of sepsis makes a plea that obstetrics be given as much consideration and dignity as general surgery.

Delmas and Brémond¹⁷³ recommend the use of sulpharsenol as a preventive measure in puerperal infection and Bär¹⁷⁴ suggests the intravenous injection of alcohol for this purpose. Bernard¹⁷⁵ praises antistreptococcus serum for septicemia, pyemia, and septicopyemia, while Armstrong and Shaw¹⁷⁶ condemn it. (In this country as well as abroad there are very few who have any faith in antistreptococcus serum, as shown by Novak.¹⁷⁷)

Convelaire, Portes, and Digonnet¹⁷⁸ advocate total hysterectomy for certain cases of late hemorrhage in the puerperium, and Solomons¹⁷⁹ reports two cases of puerperal sepsis treated by hysterectomy. One patient died. Desmoyers¹⁸⁰ also favors hysterectomy in certain cases of sepsis. Laffont, Houël, and Ferrari¹⁸¹ report seven cases of ligation of the vena cava. (Aside from the opening of abscesses, surgical operations on puerperal women are generally inadvisable. Only in very rare instances is hysterectomy or ligation of veins necessary.)

THE NEWBORN

Physiology.—From a study of 13,853 births, Hellmuth¹⁸² comes to the conclusion that there is no relationship between birth weight and month of the year. DeLee¹⁸³ reports in detail the method of identification of newborn babies which is used at the Chicago Lying-In Hos-

pital. Greer, Johnson, and Johnstone¹⁸⁴ found that serum albumin does not appear to be frequently a normal constituent of the newborn child's urine, but that its presence accompanies definite clinical disturbances in the mother or child.

In 1923 Skinner¹⁸⁵ reported that he observed 14 goiters in the newborn in a series of 140 confinements. Since that time, he has asked his obstetric patients to take 10 mg. of iodine three times a week, and among 900 prospective mothers, not a single child was born with a goiter from a mother who took iodine regularly. Hence congenital goiter can be avoided by the administration of iodine. (Iodine should be given to nearly every pregnant woman especially if she lives in a "goiter-belt.")

Complications.—From a study of 26 fetuses born of tuberculous mothers but having no contact with them after birth, Calmette, Valtis, and Lacorume¹⁸⁶ conclude that although one cannot deny that tuberculosis may be transmitted by the direct passage of tubercle bacilli through a healthy or injured placenta, this form of transmission is relatively infrequent. On the other hand, transplacental infection by the ultravirus of tuberculosis occurs much more commonly, but this infection is well tolerated.

Reed¹⁸⁷ details an epidemic of impetigo or pyodermatitis neonatorum which occurred at the Wesley Memorial Hospital (Chicago) and discusses the etiology and management of these cases. He found that immunogen was an excellent preventative. Holder¹⁸⁸ praises gentian violet for the treatment of impetigo. (Impetigo must be looked for at all times and in every nursery. Prevention is important and instant and strict isolation of every case is most essential. Every hospital has its favorite treatment and perhaps all are equally effective.)

Schmitt¹⁸⁹ studied the late development of children born of previously radiated mothers. Of the 42 pregnancies in 25 women, 8 ended in abortion, 2 terminated prematurely, 31 were full-term, and one patient was still pregnant at the time of the report. All of the 34 children born alive (1 twin) had normal mentality, and the only physical abnormality noted was a case of congenital heart disease. In the discussion of this paper, Karg,¹⁹⁰ Maurer,¹⁹¹ and Flaskamp¹⁹² agreed with Schmitt that radiation does not harm the offspring. Animal experiments led Yamato¹⁹³ to the same conclusion, but Murphy's¹⁹⁴ studies indicate that as yet it cannot be stated that preconception maternal pelvic radium or x-ray irradiation is or is not prejudicial to the subsequent children. However, irradiation of pregnant animals or human beings is a procedure extremely dangerous to the offspring.

It is generally taught that asphyxia neonatorum is a common cause of cerebral birth injury but Ford¹⁹⁵ could not produce brain lesions in cats and kittens by the employment of experimental asphyxia. Henderson¹⁹⁶ discusses the prevention and treatment of asphyxia of the newborn and recommends a special apparatus. Kreiselman, Kane, and Swope,¹⁹⁷ and also Flagg¹⁹⁸ likewise publish accounts of new apparatus for the resuscitation of asphyxiated newborn babies. (These special devices are usually unnecessary if one knows how to insert a moderately hard catheter, size 14 French, into the child's lungs through the trachea. This procedure aided by keeping the baby warm will resuscitate practically every baby which can be reanimated; that is, provided there is no serious intracranial damage.) For the treatment of asphyxia, Wilson¹⁹⁹ advocates the injection of alpha-lobelin into

the umbilical vein. (The reviewer has seen good results from the intramuscular injection of this drug, but has had no experience with the author's route.) Seidentopf²⁰⁰ influences the fetal heart tones in utero in cases of asphyxia by injecting atropin or amyl nitrite into the mother's veins. Spier²⁰¹ also injects drugs into the maternal circulation to overcome asphyxia but Schwarcz²⁰² injects drugs directly into the fetus through the mother's abdomen.

Johnson²⁰³ reports a series of 1,000 fetal autopsies performed at the Sloane Hospital. Serbin²⁰⁴ details 320 postmortems performed at the Chicago Lying-In Hospital. Kamperman²⁰⁵ analyzes 163 fetal deaths, Nathan and Drolet²⁰⁶ review 500 stillbirths occurring in New York City, and Polak and Beres²⁰⁷ analyze 39 stillbirths. (All of these studies indicate the great importance of autopsies on all dead newborn babies even the macerated ones and monsters.)

Kosmak²⁰⁸ reports his second fetal death from intrauterine rupture of a velamentous cord and Torland²⁰⁹ reports a case of fetal death most likely due to quinine. (The reviewer knows of two more unpublished cases.) Falls²¹⁰ gives a group of signs and symptoms which are strongly suggestive of a deformed fetus in the uterus and Kratsch²¹¹ who studied 17 anencephalic monsters found a hypoplasia of the cortex of the suprarenal glands in all of them.

The Placenta.—According to Grosser²¹² the morphologic characteristic of the human placenta is the uniform intervillous space and the physiologic characteristic is the elimination of the vis a tergo or the motor of the maternal blood stream.

Kurtz²¹³ believes that if a placenta is immersed in water and it lies obliquely it is intact. However, if it assumes and maintains a vertical position, or if it lies at the bottom of the container it is not intact. Inflammation of the amnion and chorion was found by Siddall²¹⁴ 48 times in 1,000 consecutive placentas.

MISCELLANEOUS

A study by Pickett²¹⁵ of the results of prenatal care indicates the vast importance of this branch of obstetrics. Bailey²¹⁶ reports on five years' activity of the Maternity Service of the Second (Cornell) Division of Bellevue Hospital. C. J. Miller²¹⁷ records his observations on the differences in obstetric complications between white and colored women. He points out that obstetric injuries with the exception of fistulas are decidedly less frequent in colored women.

Johnstone²¹⁸ discusses the preventive frame of mind in obstetrics and makes a number of useful suggestions. In his presidential address, Litzenberg²¹⁹ discusses maternal mortality. He emphasizes that if the family physician who cares for at least 80 per cent of pregnant women will give them prenatal care, diagnose carefully position and presentation, be meticulously aseptic, stop unnecessary intervention, never do an operative delivery before complete dilatation, and at all times appreciate the dignity of obstetrics, the maternal and fetal mortalities will drop at once.

Greenhill²²⁰ discusses the rôle of motion pictures in obstetrics and emphasizes their special value in teaching. (At the Chicago Lying-In Hospital, Dr. DeLee has completed a number of interesting films which may be rented by physicians or medical societies.)

Bowdoin²²¹ deals with the midwife problem in Georgia and shows that in that state midwives are necessary. Findley²²² in a discussion

on the teaching of obstetrics points out that in this country the ratio of teaching hours of surgery and obstetrics is four and one-half to one which is greater than it is anywhere else in the world. Obstetrics should have a large place in the curriculum of medical schools because in general practice, obstetrics far exceeds general surgery in importance and is only second to internal medicine. One of the most stirring accounts of the hardships of obstetric practice is related by Miss Breckenridge²²³ who discusses the frontier nursing service in the Kentucky mountains. (Every physician should read this article.)

REFERENCES

- (1) *Gragert*: Ztschr. f. Geburtsh. u. Gynäk. 93: 75, 1928. (2) *Aschheim and Zondek*: Klin. Wchnschr. 7: 8, 1928. (3) *Louria and Rosenczweig*: J. A. M. A. 90: 1988, 1928. (4) *Siddall*: Ibid. 91: 779, 1928. (5) *Müller and Martinez*: Radiology 11: 191, 1928. (6) *Albano*: Zentralbl. f. Gynäk. 52: 2084, 1928. (7) *Vignes*: Progrès méd. 43: 477, 1928. (8) *Schönig*: Monatschr. f. Geburtsh. u. Gynäk. 78: 32, 1928. (9) *Frank and Goldberger*: J. A. M. A. 90: 106, 1928. (10) *Vogt*: Med. Klin. 24: 207, 1928. (11) *Fellner*: Ibid. 23: 1527, 1927. (12) *Uhlmann*: Ibid. 24: 1088, 1928. (13) *Rossinski*: Zentralbl. f. Gynäk. 52: 1072, 1928. (14) *Hartman*: Bull. Johns Hopkins Hosp. 43: 33, 1928; and AM. J. OBST. & GYNEC. 15: 534, 1928. (15) *Jolly*: J. Obst. & Gynaec., Brit. Emp. 35: 258, 1928. (16) *Heublein, Roberts, and Ogden*: Am. J. Roentgenol. 30: 64, 1928. (17) *Smith*: AM. J. OBST. & GYNEC. 15: 556, 1928. (18) *Baum*: Med. Klin. 24: 1001, 1928. (19) *Novak*: South. M. J. 21: 317, 1928. (20) *Clauberg*: Zentralbl. f. Gynäk. 52: 947, 1928. (21) *Burch*: J. Tennessee M. A. 21: 172, 1928. (22) *Gellhorn*: AM. J. OBST. & GYNEC. 16: 547, 1928. (23) *Mgalobeli*: Monatschr. f. Geburtsh. u. Gynäk. 80: 265, 1928. (24) *Benthin*: Zentralbl. f. Gynäk. 52: 858, 1928. (25) *Kallinikoff*: Monatschr. f. Geburtsh. u. Gynäk. 80: 109, 1928. (26) *Vogel*: Arch. f. Frauenk. 14: No. 3, 1928. (27) *Kienlin*: Zentralbl. f. Gynäk. 52: 622, 1928. (28) *Brandess*: Ibid. 52: 620, 1928. (29) *Spiegel*: Ibid. 52: 2957, 1928. (30) *Goldberger*: Ibid. 52: 1573, 1928. (31) *Lork*: Monatschr. f. Geburtsh. u. Gynäk. 80: 17, 1928. (32) *Schmidt*: Zentralbl. f. Gynäk. 52: 1950, 1928, and Monatschr. f. Geburtsh. u. Gynäk. 80: 349, 1928. (33) *Neumann*: Monatschr. f. Geburtsh. u. Gynäk. 80: 381, 1928. (34) *Zweifel* (Quoted by Schmidt): Zentralbl. f. Gynäk. 52: 1950, 1928. (35) *Bland*: AM. J. OBST. & GYNEC. 15: 390, 1928. (36) *Benda*: Zentralbl. f. Gynäk. 52: 1644, 1928. (37) *Levy, Beck, and Aaron*: Radiology 11: 48, 1928. (38) *Crossen and Moore*: AM. J. OBST. & GYNEC. 16: 840, 1928. (39) *Ferguson and Priestley*: AM. J. OBST. & GYNEC. 16: 82, 1928. (40) *Frey and Lardi*: Ztschr. f. Geburtsh. u. Gynäk. 93: 1, 1928. (41) *Hamilton and Kellogg*: J. A. M. A. 91: 1942, 1928. (42) *Gammeltoft*: Surg. Gynec. Obst. 46: 382, 1928. (43) *Gammeltoft*: AM. J. OBST. & GYNEC. 17: 747, 1928. (44) *Philipp*: Zentralbl. f. Gynäk. 52: 420, 1928. (45) *Peltret*: Monatschr. f. Geburtsh. u. Gynäk. 78: 350, 1928. (46) *Stillians*: Arch. Dermat. & Syph. 17: 318, 1928. (47) *Lafont and Mèle*: Gynéc. et Obst. 17: 257, 1928. (48) *Trillat and Rousset*: Ibid. 17: 264, 1928. (49) *Chappaz*: Ibid. 17: 283, 1928. (50) *Yoakam*: AM. J. OBST. & GYNEC. 15: 607, 1928. (51) *Mathieu*: Med. Sentinel 36: 366, 1928. (52) *Gellhorn*: Illinois M. J. 53: 360, 1928. (53) *Levy-Solal, Laudat, and Wolff*: Bull. Méd., Paris 42: 1127, 1928. (54) *Walker*: J. Obst. & Gynaec. Brit. Emp. 35: 271, 1928. (55) *Karg*: Monatschr. f. Geburtsh. u. Gynäk. 78: 264, 1928. (56) *Polak*: Surg. Gynec. Obst. 46: 21, 1928. (57) *Waldstein*: Monatschr. f. Geburtsh. u. Gynäk. 78: 164, 1928. (58) *Campbell*: AM. J. OBST. & GYNEC. 16: 881, 1928. (59) *Rogues*: J. Obst. & Gynaec. Brit. Emp. 35: 1, 1928. (60) *Gardiner*: J. A. M. A. 91: 1937, 1928. (61) *Speidel*: AM. J. OBST. & GYNEC. 15: 411, 1928. (62) *Péry*: Bull. Soc. d'obst. et de gynéc. 17: 45, 1928. (63) *Titus and Dodds*: AM. J. OBST. & GYNEC. 16: 90, 1928. (64) *Ivens*: J. Obst. & Gynaec. Brit. Emp. 35: 307, 1928. (65) *DeLee*: Personal Communication. (66) *Kahn*: AM. J. OBST. & GYNEC. 16: 201, 1928. (67) *Mussey and Keith*: J. A. M. A. 91: 2044, 1928, and AM. J. OBST. & GYNEC. 15: 366, 1928. (68) *Titus, Dodds, and Willets*: AM. J. OBST. & GYNEC. 15: 303, 1928. (69) *Locser*: Zentralbl. f. Gynäk. 52: 1405, 1928. (70) *Krieger*: Ibid. 52: 2714, 1928. (71) *Laffont and Jahier*: Bull. Soc. d'obst. et de gynéc. 6: 579, 1928. (72) *Polak*: Illinois M. J. 54: 352, 1928. (73) *Clason*: Acta obst. et gynec. Scandinav. 7: 43, 1928. (74) *Falls*: Illinois M. J. 54: 224, 1928. (75) *Herrmann*: Zentralbl. f. Gynäk. 52: 1080,

1928. (76) *Duncan and Seng*: AM. J. OBST. & GYNEC. 16: 557, 1928. (77) *Kamnicker*: Zentralbl. f. Gynäk. 52: 3058, 1928. (78) *Hofbauer*: Bull. Johns Hopkins Hosp. 42: 118, 1928, and New England J. M. 118: 427, 1928. (79) *Hofbauer and Timbres*: J. Urol. 20: 413, 1928. (80) *Knaus*: Zentralbl. f. Gynäk. 52: 2986, 1928. (81) *Hofbauer*: AM. J. OBST. & GYNEC. 16: 245, 1928. (82) *Wittenbeck*: Zentralbl. f. Gynäk. 52: 1759, 1928. (83) *Hatzky*: Ibid. 52: 1056, 1928. (84) *Calmann*: Ibid. 52: 432, 1928. (85) *Wigger*: Ibid. 52: 2633, 1928. (86) *Temesvary*: Ibid. 52: 2088, 1928. (87) *Liebe*: Ibid. 52: 1417, 1928. (88) *Hochne*: Ibid. 52: 712, 1928. (89) *Bailey*: AM. J. OBST. & GYNEC. 16: 324, 1928. (90) *Potter*: Ibid. 15: 336, 1928. (91) *Danforth*: Ibid. 15: 505, 1928. (92) *Beckman*: Ibid. 15: 72, 1928. (93) *Gwathmey*: J. A. M. A. 111: 1774, 1928. (94) *Lynch*: California and Western Med. 1928. (95) *Roettger*: Zentralbl. f. Gynäk. 52: 742, 1928. (96) *Vogt*: Monatschr. f. Geburtsh. u. Gynäk. 80: 79, 1928, and Zentralbl. f. Gynäk. 52: 2802, 1928. (97) *Gauss*: Monatschr. f. Geburtsh. u. Gynäk. 80: 184, 1928. (98) *Pankow*: Quoted by Kobes. (99) *Doederlein*: Monatschr. f. Geburtsh. u. Gynäk. 80: 184, 1928. (100) *Zweifel*: Ibid. 80: 184, 1928. (101) *Rupp*: Zentralbl. f. Gynäk. 52: 2936, 1928. (102) *Muetz*: Ibid. 52: 2819, 1928. (103) *Kobes*: Ibid. 53: 42, 1929. (104) *Katz*: Ibid. 52: 2894, 1928. (105) *Siegert*: Ibid. 52: 615, 1928. (106) *Mayer*: Ibid. 52: 1242, 1928. (107) *Mathieu and Schauffler*: AM. J. OBST. & GYNEC. 16: 390, 1928. (108) *Greenhill*: J. A. M. A. 78: 98, 1922. (109) *Falls*: AM. J. OBST. & GYNEC. 15: 399, 1928. (110) *Vidal*: Bull. Soc. d'obst. et de gynéc. 17: 35, 1928. (111) *Küstner*: Monatschr. f. Geburtsh. u. Gynäk. 79: 286, 1928. (112) *Engels*: Zentralbl. f. Gynäk. 52: 433, 1928. (113) *Cohen*: Ztschr. f. Geburtsh. u. Gynäk. 93: 764, 1928. (114) *Abraham*: Monatschr. f. Geburtsh. u. Gynäk. 79: 393, 1928. (115) *Greenhill and Bloom*: J. A. M. A. 112: 21, 1929. (116) *DeLee*: Surg. Gynec. Obst. 46: 696, 1928. (117) *McNally*: AM. J. OBST. & GYNEC. 16: 407, 1928. (118) *Schwenke*: Monatschr. f. Geburtsh. u. Gynäk. 80: 82, 1928. (119) *Barton, Caldwell, and Studdiford*: AM. J. OBST. & GYNEC. 15: 16, 1928. (120) *Framm*: Zentralbl. f. Gynäk. 52: 609, 1928. (121) *Küstner*: Monatschr. f. Geburtsh. u. Gynäk. 78: 379, 1928. (122) *McGuinness*: Canad. M. A. J. 18: 289, 1928. (123) *Hertzler*: J. Kansas M. Soc. 28: 52, 1928. (124) *Potter*: AM. J. OBST. & GYNEC. 1: 560, 1921. (125) *Ponomazoff*: Gynéc. et Obst. 18: 103, 1928. (126) *Gordon*: AM. J. OBST. & GYNEC. 17: 307, 1928. (127) *Stein and Levinthal*: AM. J. OBST. & GYNEC. 16: 229, 1928. (128) *Danforth and Grier*: Ibid. 16: 239, 1928. (129) *Aschner*: Zentralbl. f. Gynäk. 52: 1977, 1928. (130) *DeLee, Nadelhoffer, and Greenhill*: AM. J. OBST. & GYNEC. 16: 784, 1928. (131) *Frey*: Zentralbl. f. Gynäk. 52: 2485, 1928. (132) *Stander*: AM. J. OBST. & GYNEC. 12: 633, 1926. (133) *Greenhill*: J. A. M. A. 90: 1023, 1928. (134) *Phaneuf*: Surg. Gynec. Obst. 47: 851, 1928. (135) *Groene*: Acta obst. et Gynec. Scandinav. 7: 83, 1928. (136) *Delmas*: Bull. Soc. d'obst. et de gynéc. 4: 413, 1928. (137) *Schroeder*: Zentralbl. f. Gynäk. 52: 874, 1928. (138) *Ward, Lyon, and Bemis*: AM. JOUR. OBST. & GYNEC. 16: 655, 1928. (139) *Zangemeister*: Arch. f. Gynäk. 133: 28, 1928. (140) *Füth*: Ibid. 133: 1, 1928. (141) *Douglass and Siegel*: AM. J. OBST. & GYNEC. 15: 671, 1928. (142) *Müller, C. J.*: New Orleans M. & S. J. 80: 637, 1928. (143) *Henkel*: Ztschr. f. Geburtsh. u. Gynäk. 93: 103, 1928. (144) *Martin*: Monatschr. f. Geburtsh. u. Gynäk. 78: 61, 1928. (145) *Essen-Moeller*: AM. J. OBST. & GYNEC. 15: 612, 1928. (146) *Goethals*: AM. J. OBST. & GYNEC. 15: 627, 1928. (147) *Kellogg, Taylor, Eades, and Weller*: Ibid. 16: 357, 1928. (148) *Paramore*: J. Obst. & Gynec. Brit. Emp. 35: 292, 1928. (149) *Jarcho*: Surg. Gynec. Obst. 46: 265, 1928. (150) *Sachs*: Zentralbl. f. Gynäk. 52: 866, 1928. (151) *Aschermann*: Monatschr. f. Geburtsh. u. Gynäk. 78: 75, 1928. (152) *Zangemeister*: Arch. f. Gynäk. 133: 28, 1928. (153) *Nathanson*: AM. J. OBST. & GYNEC. 16: 44, 1928. (154) *Klaften*: Arch. f. Gynäk. 135: 190, 1928. (155) *Lowenfeld and Widdows*: J. Obst. & Gynec. Brit. Emp. 35: 114, 1928. (156) *Harding, Murphy, and Downs*: AM. J. OBST. & GYNEC. 16: 765, 1928. (157) *Castellani*: J. A. M. A. 90: 1773, 1928. (158) *Kraul*: Zentralbl. f. Gynäk. 52: 873, 1928. (159) *Nelson, and Pattee*: AM. J. OBST. & GYNEC. 16: 73, 1928. (160) *Young*: British M. J. 1: 967, 1928. (161) *Findley*: Ohio State M. J. 24: 773, 1928. (162) *Bourne*: Recent Advances in Obstetrics and Gynecology, P. Blakiston's Sons & Co., Philadelphia, ed. 2, p. 15-16, 1928. (163) *Harris, and Brown*: AM. J. OBST. & GYNEC. 16: 332, 1928. (164) *Harris, and Brown*: Bull. Johns Hopkins Hosp. 43: 190, 1928. (165) *Bryce*: Med. J. Australia 2: 102, 1928. (166) *Sommer*: Zentralbl. f. Gynäk. 52: 942, 1928. (167) *Goodall, and Wierman*: AM. J. OBST. & GYNEC. 16: 339, 1928. (168) *Watson*: Ibid. 16: 157, 1928. (169) *Melency, Zaytzeff, and Harvey*: Ibid.

- 16: 180, 1928. (170) *Allan, and Bryce*: Med. J. Australia 1: 390, 1928. (171) *Watson*: AM. J. OBST. & GYN. 16: 536, 1928. (172) *Bonney*: Lancet 1: 435, 1928. (173) *Delmas and Brémont*: Bull. Soc. d'obst. et de gynéc. 17: 433, 1928. (174) *Bär*: Zentralbl. f. Gynäk. 52: 3133, 1928. (175) *Bernard*: Gynéc. et Obst. 17: 216, 1928. (176) *Armstrong and Shaw*: Brit. M. J. 2: 1077, 1928. (177) *Novak*: J. A. M. A. 86: 189, 1926. (178) *Convelaire, Portes and Digonnet*: Gynéc. et Obst. 18: 370, 1928. (179) *Solomons*: Irish J. Med. Sci., 6th Series, No. 31, 1928. (180) *Desmoyers*: Bull. méd. 42: 1146, 1928. (181) *Laffont, Houël and Ferrari*: Bull. Soc. d'obst. et de gynéc. 17: 373, 1928. (182) *Hellmuth*: Ztschr. f. Geburtsh. u. Gynäk. 93: 147, 1928. (183) *DeLee*: J. A. M. A. 90: 193, 1928. (184) *Grier, Johnson and Johnstone*: South. M. J. 21: 860, 1928. (185) *Skinner*: M. J. & Rec. 127: 381, 1928. (186) *Calmette, Valtis and Lacorumbe*: Ann. de l'Inst. Pasteur 42: 1149, 1928. (187) *Reed*: Arch. Dermat. & Syph. 18: 26, 1928. (188) *Holder*: AM. J. OBST. & GYN. 15: 857, 1928. (189) *Schmitt*: Monatsschr. f. Geburtsh. u. Gynäk. 80: 157, 1928. (190) *Karg*: Ibid. 80: 195, 1928. (191) *Maurer*: Ibid. 80: 195, 1928. (192) *Flaskamp*: Ibid. 80: 195, 1928. (193) *Yamato*: Jap. J. Obst. & Gynec. 10: 2, 1928. (194) *Murphy*: Surg. Gynec. Obst. 47: 201, 1928. (195) *Ford*: Bull. Johns Hopkins Hosp. 42: 70, 1928. (196) *Henderson*: J. A. M. A. 90: 583, 1928. (197) *Kreiselman, Kane and Swope*: AM. J. OBST. & GYN. 15: 552, 1928. (198) *Flagg*: J. A. M. A. 91: 788, 1928. (199) *Wilson*: AM. J. OBST. & GYN. 91: 379, 1928. (200) *Seidentopf*: Zentralbl. f. Gynäk. 52: 3122, 1928. (201) *Spier*: Zentralbl. f. Gynäk. 52: 2082, 1928. (202) *Schwarz*: Ibid. 52: 817, 1928. (203) *Johnson*: Colorado Med. 25: 78, 1928. (204) *Serbin*: AM. J. OBST. & GYN. 15: 682, 1928. (205) *Kamperman*: Ibid. 15: 66, 1928. (206) *Nathan and Drolet*: New York State J. Med. 28: 78, 1928. (207) *Polak and Beres*: Am. J. Surg. 4: 143, 1928. (208) *Kosmak*: AM. J. OBST. & GYN. 16: 438, 1928. (209) *Torland*: J. A. M. A. 90: 1190, 1928. (210) *Falls*: AM. J. OBST. & GYN. 16: 801, 1928. (211) *Kratsch*: Ztschr. f. Geburtsh. u. Gynäk. 92: 579, 1928. (212) *Grosser*: Med. Klin. 24: 20, 1928. (213) *Kurtz*: Zentralbl. f. Gynäk. 52: 1578, 1928. (214) *Siddall*: AM. J. OBST. & GYN. 15: 828, 1928. (215) *Pickett*: Kentucky M. J. 26: 52, 1928. (216) *Bailey*: AM. J. OBST. & GYN. 15: 462, 1928. (217) *Miller, C. J.*: Ibid. 16: 662, 1928. (218) *Johnstone*: Brit. M. J. 1: 6, 1928. (219) *Litzenberg*: J. A. M. A. 91: 1587, 1928. (220) *Greenhill*: Texas State J. Med. 24: 405, 1928. (221) *Bowdoin*: J. A. M. A. 91: 460, 1928. (222) *Findley*: AM. J. OBST. & GYN. 16: 611, 1928. (223) *Breckenridge*: Ibid. 15: 867, 1928.

Selected Abstracts

Miscellaneous

Firgau, L.: The Increase in Basedowoid Disease in Women Since the War and Its Explanation. Klinische Wochenschrift, 1926, v, 890.

Firgau uses Stern's classification of "Basedowoid" as a symptom complex, with the following subjective symptoms: Muscle weakness, nervousness, memory weakness, inability to concentrate, tremors, palpitation, excessive perspiration, loss of hair, and irregular menses. The objective findings of this condition include a small soft thyroid, a weak voice, many of the stigmas of hysteria, vasomotor disturbances, widened palpebral fissures, often positive Graefe, Möbius, and Stellwag signs, a fine tremor and a low volume, soft, arrhythmic pulse.

This symptom complex increased to such an extent in the post-war period that the author has studied the problem and presents statistics. Of 270 women examined in the Koenigsberger Krankenhaus, ranging in age from nine to eighty-two years, over 28 per cent presented this picture of Basedowoid disturbance. On the other hand, 41 per cent of 183 patients between the ages of sixteen and forty-nine years, i.e., during the active sexual life, presented this same picture.

The author feels that this symptom complex is produced by a derangement of the vegetative nervous system, with an accompanying hypertrophy of the thyroid gland, and is not due to a derangement of thyroid function alone. Furthermore, since the greatest incidence occurs during the active sexual life of the woman, Firgau believes that disturbances of the normal sexual life play an important rôle. Of the 75 cases between puberty and the menopause, 45, or a majority, gave a history of abnormal or disturbed sexual function.

RALPH A. REIS.

Warren, S. B.: *The Effects of Amniotic Fluid on Serosa and Serous Surfaces*, Arch. Path. 6: 860, 1928.

Based on the assumption that the amniotic fluid may have as one of its chief functions, the prevention of adhesions between the fetus and the amniotic sac, Warren used this fluid or an extract of it in an attempt to prevent adhesions following abdominal operations. He performed a series of carefully controlled experiments on guinea pigs and other animals. His technic was essentially as follows: After properly preparing the skin of the abdomen, he made an incision which exposed several loops of bowel. He then scarified the peritoneal coats as well as the parietal peritoneum and sutured the abdomen. No great care was exercised in the asepsis. Following this, intraperitoneal injections of 10 c.c. of warm, sterile amniotic fluid were given. The controls received 10 c.c. of warm sterile salt solution; other controls received no injections.

Some animals were treated with powdered amniotic concentrate but it was difficult to keep this preparation sterile.

The author concludes from these experiments that amniotic fluid or amniotic concentrate may be used without ill effect in the peritoneal cavity of animals. The amniotic concentrate, prepared by fractional alcoholic precipitation has many advantages over the whole fluid, viz., the amount of protein is reduced, the concentrate is sterile, stable, and easily handled. The fluid does not interfere with healing. Amniotic concentrate added to heparinized plasma did not retard growth of fibroblasts in tissue culture.

The action of the fluid in preventing adhesions is probably due to two factors. The first is the marked reduction in the time of oozing of injured tissues. This lessens the amount of blood and fibrin on their surfaces and therefore restricts the tendency to form fibrinous adhesions. The second is the slow rate of absorption of the fluid, permitting it to remain as a lubricant between eroded surfaces until the period is past when adhesions are most likely to form.

These results seem to indicate that amniotic fluid is safe almost as a routine procedure in abdominal operations in the human. The amniotic concentrate is safe, more convenient and practically as effective as whole amniotic fluid.

Obstetricians need have no fear of amniotic "spill" in cases of cesarean section. Uninfected amniotic fluid can do no harm and is even of value in preventing adhesions.

WILLIAM B. SERBIN.

The American Journal of Obstetrics and Gynecology

VOL. XVII

ST. LOUIS, JUNE, 1929

No. 6

Original Communications

BONE MARROW STIMULATION IN THE PUERPERAL WOMAN BY INJECTION OF PITUITRIN AND INTRAVENOUS GLUCOSE, AND ITS CLINICAL APPLICATION

BY J. HOFBAUER, M.D., F.A.C.S., BROOKLYN, N. Y.

(From the Department of Obstetrics, Johns Hopkins University and Hospital)

CURRENT medical literature indicates a tendency on the part of various investigators to consider the reticulo-endothelial system as being engaged in the destruction of bacteria as well as the production of antibodies. For some years evidence has been accumulating to show the essentially phagocytic nature of this system in artificially produced infections in animals. The blockade of the system, on the one hand, and its stimulation, on the other, have been extensively studied with a view to determining the possibility of augmenting its function. It should be noted that any appraisal of the results obtained in such experimental studies is still sub judice.

An essential difference between naturally acquired infections in man and artificially produced diseases in animals lies in the facts that, in the former, the bacteria, as a rule, enter the blood stream gradually and that the activity of the defensive mechanism extends over a much longer period of time than obtains in experimental intravenous injections of bacteria. Occasionally, however, there occur instances in the human of a sudden pouring into the venous system of infectious material derived from thrombi or remnants of placental tissue. In all considerations of this kind it should be kept in mind that the evaluation of any agent for combating infectious processes must rest on careful observation and interpretation of the reactions induced in the morbid organism, and ultimately, of course, on clinical results.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

Recently several workers have called attention to the fact that the storing function of the reticulo-endothelial system can be influenced by the administration of hormones. Bayer and Fromm found a promotion of phagocytosis and an increase of the opsonic index following the use of insulin. Louros and Sheyer showed that in animals the course of experimental streptococcal infection could be favorably influenced by the employment of adrenalin or a solution of pituitary extract; while Saxl and Donath have presented data demonstrating the control which the pituitary exercises over the system under consideration. Moreover, their studies have added appreciably to our knowledge by showing that, while various substances injected into the blood stream are, as a rule, quickly deposited in the reticulo-endothelial system, a transient blockade of the system can be provoked by the previous administration of pituitrin. In such an event, any therapeutic agent injected intravenously is forced to remain in the blood stream longer than usual, and is thus enabled to prolong its favorable action upon the organism.

By reason of the widespread interest which centers around the demonstrated value of blood transfusion in certain cases of puerperal infection and its failure in many others, an experimental study was undertaken with a view to ascertaining, if possible, the effect of pituitary extract on the blood-forming organs of the normal puerperal woman, more particularly when its administration precedes other therapeutic measures. All evidence at present available indicates that the introduction of blood into the infected organism acts as a powerful stimulant to the reticulo-endothelial system, in general, and the bone marrow, in particular. As long as these structures are capable of reacting transfusion may serve to stimulate, or even reestablish, their function following impairment resulting from the septic process. Clinical experience, however, not infrequently shows a discrepancy between the amount of blood transfused and the amelioration of the patient's condition. In view of the aforementioned effect of pituitrin our first concern was to ascertain whether its addition to our therapeutic resources would reinforce the mechanism combating infection. Bearing in mind that in septic patients improvement in clinical results has also been reported following the intravenous administration of hypertonic solutions of glucose, we further sought to determine the effect of this therapeutic agent on the bone marrow during the puerperium. It was hoped that through research along these lines some knowledge might be gained concerning the defensive forces of the organism in coping with puerperal infection.

It is the object of this report to describe some of the phenomena concomitant with the reaction provoked in the puerperal woman by use of these drugs, and to interpret their clinical significance. In order to obtain uniform experimental conditions, afebrile patients were selected on the fourth day of the puerperium, and the injections were repeated

on three successive days. Prior to the first injection a white and differential blood count was made. Thereafter, the response to pituitary extract, or to a combination of pituitary extract and hypertonic glucose solution, was recorded at regular intervals. In most cases 400 to 500 c.c. of a 10 per cent solution of glucose were infused; a few received

TABLE I. PARA ii, No. 3561. PUERPERIUM AFEBRILE

MARCH 18	W.B.C	P.M.N.	P.M.E.	P.M.B.	S.L.	L.L.	L.M.	TR.	MYELO.
2:05 P.M.	10,320	70	6	1	14	2	4	0	0
2:10	<i>Pituitrin 1/2 c.c.</i>								
4:10	8,880	68	4	0	17	0	10	1	0
6:10	9,960	75	2	0	19	0	4	0	
10:10	9,070								
MARCH 19									
9:45 P.M.	<i>Pituitrin 1/2 c.c.</i>								
12:35 P.M.	11,480	75	2	0	15	0	7	0	3
1:30 P.M.	<i>Pituitrin 1/2 c.c.</i>								
3:30	9,560	74	2	0	17	1	5	0	3
5:30	8,520	74	2	0	18	1	4	0	2
9:30	7,870	72	2	0	17	1	5	0	2
MARCH 20									
11:15 A.M.	<i>Pituitrin 1/2 c.c.</i>								
1:15 P.M.	8,680	61	4	0	26	1	5	0	3
3:15 P.M.	8,760	69	2	0	23	2	3	0	3

TABLE II. PARA iii, No. 11,056. PUERPERIUM AFEBRILE

MARCH 18	W.B.C	P.M.N.	P.M.E.	P.M.B.	S.L.	L.L.	L.M.	TR.	MYELO.
1:25 P.M.	7,360	72	2	0	14	4	7	0	0
1:30	<i>Pituitrin 1/2 c.c.</i>								
1:45	<i>10% Glucose, 500 c.c.</i>								
3:30	7,400	70	3	0	20	4	2		
5:30	7,240	66	2	0	24	1	5	0	2
9:30	5,440								
MARCH 19									
9:45 A.M.	<i>Pituitrin 1/2 c.c.</i>								
12:05 P.M.	7,640	60	3	0	20	3	10	0	4
12:55	<i>Pituitrin 1/2 c.c.</i>								
1:10	<i>10% Glucose, 500 c.c.</i>								
2:55	9,280	55	6	0	30	1	8	0	3
4:55	8,400	62	3	0	29	1	6	0	2
8:55	7,200								
MARCH 20									
1:15 P.M.	<i>Pituitrin 1/4 c.c.</i>								
	<i>10% Glucose, 500 c.c.</i>								
3:15	8,880	72	1	0	22	1	2	0	3
5:15	8,400	67	2	0	20	2	3	2	3

Abbreviations:

P.M.N., Polymorphonuclear leucocytes.
P.M.E., Eosinophiles.
P.M.B., Basophiles.
S.L., Small lymphocytes.
L.L., Large lymphocytes.
L.M., Large mononuclears.
Tr., Transitionals.
Myelo., Myelocytes and myeloblasts.

100 to 125 c.c. of a 15 per cent solution. Save for a slight elevation of temperature, which subsided in a few days, no untoward reaction of any kind was observed as a sequel to the injections.

The consistent results obtained in this study may be exemplified by presentation of the findings subjoined. A few hours after the injections there occurred an initial leucopenia which later gave way to a moderate leucocytosis. The myeloid response was evidenced by the appearance in the blood of myelocytes and myeloblasts, and occasionally of nucleated red blood cells. On the first day a considerable increase in small lymphocytes, large mononuclears and platelets occurred, which became even more pronounced on the second and third days, a phenomenon of some interest. After the use of glucose and pituitrin the response was more definite than after pituitrin alone.

In all of the seventeen cases studied the results obtained were essentially uniform, so that the presentation of two records will be illustrative of the reactions observed in the series.

DISCUSSION

It was for the purpose of obtaining evidence of the effect of pituitary extract and hypertonic solution of glucose on the bone marrow of the puerperal woman that the experiments herein reported were conducted. A consideration of the rationale underlying such therapy in puerperal infection guided our investigations. It was hoped that some light might be thrown on the mechanism involved in the artificially induced reaction of the reticulo-endothelial system.

In recent years infusion of hypertonic glucose solution has been extensively employed in the treatment of various acute infectious conditions. Glucose is now regarded as a source of energy and a general stimulant to cell metabolism. Its action as a cardiotonic and diuretic also renders it of value in the treatment of these conditions. The data presented in this study relative to the stimulation of the hematopoietic organs by hypertonic solutions of glucose may serve to suggest its employment as a new agent in enhancing the resistance of the organism by its action on the organs concerned in the elaboration of antibodies.

During the past few years a consideration of the forces at work in the struggle of the organism against pathogenic bacteria has inspired several investigators to an experimental study of the behavior of the bone marrow in acute and subacute infections. It was found that the fat had been replaced largely by cellular marrow. Indeed, it is the rapid multiplication of cells of the myelocyte or monocyte type, frequently associated with an active development of erythroblasts or immature bone marrow elements and their rapid delivery into the blood stream, which signalized the peculiarities of the phenomena described by Schilling, Dietrich, Hartwich, Ansolmino and others. It was

emphasized in their studies, however, that in severe infections such metaplastic changes failed to occur.

On the basis of this evidence it seemed logical to conclude that, for the purpose of potentiating the vital processes and enhancing their therapeutic action, a stimulation of the bone marrow might be of service. Most of the recent work undertaken in the search for a therapeutic agent was instigated by advances in our knowledge of hormone activities and of the stimulating effect of colloidal substances on the mesenchyme. The effect of intravenous injections of quartz, india ink, carmine, colloidal metals and coal on the reticulo-endothelial system has subsequently been studied by Elvidge, Gay and others. Yet, most of the substances proposed as bone marrow stimulants were subsequently abandoned on account of certain harmful effects associated with their employment.

With the fact established that the infusion of hypertonic solutions of glucose elicits systemic reactions in which the bone marrow of the puerperal woman plays a definite part, another factor calls for special consideration. Evidence has been adduced of late to show that a comparatively slight increase in the salt concentration of the blood is followed by a considerable increase in its bactericidal power which persists for a period of several hours. As yet no adequate explanation has been given for this remarkable phenomenon which has been established by Fleming who showed that a greatly increased power of destroying the infecting bacteria may be conferred on the patient's blood by the intravenous injection of hypertonic salt solutions.

Little evidence concerning the response of the bone marrow to drugs which act upon the sympathetic and parasympathetic systems is available in the literature. Falta has demonstrated an increase in the lymphocytes and large mononuclear cells of the blood after the injection of pituitrin. In several instances this was associated with a marked increase in the number both of the erythrocytes and polymorphonuclear leucocytes. Papilian recently showed that a similar bone marrow reaction can be elicited by pilocarpin, and occasionally by adrenalin. From a brief consideration of the evidence submitted as a result of our studies it follows that the bone marrow of the puerperal woman responds to a much smaller dose of pituitrin than was employed in the above-quoted investigations, an observation which may be referable to the fact that in the pregnant state the bone marrow is more highly active on account of the increased requirements imposed upon it. (Naegeli.)

COMMENT

The data presented in this article serve to establish the fact that by a combination of the intravenous administration of hypertonic glucose solution with a preliminary injection of pituitary extract a vigorous, stimulating effect on the bone marrow of the puerperal woman can be

evoked. Furthermore, in view of the pronounced rise in the number of red corpuscles, lymphocytes and platelets in the blood, which is maintained for a considerable period of time, it seems plausible to assume that they, as well as the mononuclear cells which are found in abundance in the spleen pulp, are forced out into the general circulation by means of splenic contractions. The reaction obtained is associated with functional responses that are likely to increase individual resistance against infection, as has recently been shown by Saxl and others.

The bearing of the increased functional activity of the reticulo-endothelial system on the treatment of puerperal infection is worthy of thought. In our experience, transfusion preceded by an injection of pituitrin renders better service in septic processes than when used alone. Glucose, as a stimulant of phagocytic tissue elements, appears to be of particular value in those cases where a tendency toward localization of the infection in the parametrium becomes manifest. In corroboration of our experience, Polak made the following statement: "In the parametrial cases it is surprising how boosting these patients along with transfusions and pituitrin has improved their general well-being. Stimulation of the pituitary gland or the intramuscular use of pituitary extract in conjunction with repeated small transfusions of blood are now accepted as rational aids in the stimulation of Nature's supporting processes."

It is felt on our part that for an evaluation of the usefulness of hormonal principles in this field more extended investigation is necessary. This is likewise true with respect to the use of insulin in puerperal infection.

At this point it might be added that the employment of hypertonic glucose solution as a specific agent in the treatment of *eclamptic* conditions will be dealt with in a future communication.

In conclusion, I wish to express my obligation to Dr. R. C. Cumming for making the differential stains and blood counts.

REFERENCES

- Bayer and Fromm*: Deutsche med. Wehnschr. 1926. *Saxl and Donath*: Wien. klin. Wehnschr. 1925, p. 1202; 1928, No. 33; Wien. Arch. f. inn. Med. 13: 7-34, September, 1926. *Schilling*: Deutsch. med. Wehnschr. 1925. *Dietrich*: Verhandl. d. Cong. f. inn. Med. 1925. *Hartwich*: Virchow's Arch. f. path. Anat. 233. 1921. *Anselmino*: Ibid. 226. 1926. *Fleming, R.*: Brit. J. Exper. Path. 1926. *Papilian*: Virchow's Arch. 266. 1927. *Falta*: Ztschr. f. Klin. Med. 71. 1910. *Polak, J. O.*: AM. J. OBST. & GYNEC. 15: 295, 1928. *Louros and Sheyer*: Ztschr. f. d. ges. exper. Med. 55: 702-730, 1927. *Elbridge, A. R.*: J. Path. & Bact. 29: 325, 1926. *Gay, F. P.*: Am. J. Path. 2: 446, 1926.

THE REMOVAL OF BLOOD PLASMA AND THE REINFUSION OF CORPUSCLES IN THE TREATMENT OF THE CONVULSIVE TOXEMIA OF PREGNANCY*

A PRELIMINARY REPORT

BY FREDERICK C. IRVING, M.D., AND JOSEPH V. TAYLOR, M.D.,
BOSTON, MASS.

(From the Department of Obstetrics, Harvard Medical School and the Boston Lying-in Hospital)

OUR present conception of eclampsia is based on the presence in the body of a hypothetical toxin. The nature of this toxin is unknown and the site of its origin so far remains a mystery. Since eclampsia is a morbid state peculiar to pregnant women, it has been held, with some show of reason, that its causative toxin is elaborated in the product of conception and therefore that emptying the uterus is the most logical means of arresting the disease. Acting upon this theory, as soon as the patient had an eclamptic fit, pregnancy was terminated by accouchement forcé, by induction of labor, or by cesarean section. While some women, by reason of their strength, survived such therapy, it was found that others succumbed to the disease, to the treatment, or to a combination of the two, in sufficiently large numbers to convince thoughtful obstetricians of the necessity of finding something better. Out of this necessity arose the two leading methods of attack which are based on a symptomatic treatment of the disease. These are the use of morphine, chloral, chloroform, and absolute quiet according to Stroganoff and the intravenous administration of magnesium sulphate as advocated by Lazard and others. Whenever either of these methods has been consistently employed, a gratifying drop in the maternal mortality rate has followed. Magnesium sulphate, if given often enough, will check the convulsions in almost all cases, but nevertheless a considerable number of eclamptics so treated will die. There can be no doubt, however, that the policy of disregarding the pregnancy and treating the disease now accepted in most leading clinics gives the average convulsive toxemic a much better chance for her life than she ever had before.

If it be true that the clinical picture of eclampsia results from a toxin in the circulating blood and if it were possible to remove a considerable amount of this substance without seriously impairing the vital processes we would be employing the most direct and logical method

*Read at a meeting of the Brooklyn Gynecological Society, November 2, 1928.

of treatment. Venesection, which in a degree accomplishes this purpose, has the sanction of long usage. It is used today either alone or combined with the Stroganoff régime in many German and some American clinics. Until the advent of the Stroganoff and magnesium sulphate treatments, it was our sole weapon against postpartum eclampsia. The chief objection to venesection has always been that if an amount of blood sufficiently large to do any good were withdrawn, so many red cells were removed from the circulation that anemia and lack of resistance to infection followed. Since the toxins of most diseases are carried in the blood plasma and not in combination with the corpuscles, we may reasonably assume that if such a toxin exists in eclampsia it is very likely transported in the same way. The problem, therefore, is one of removing from the body a considerable amount of plasma without the loss of corpuscles. In this connection the work of Abel, Rowntree and Turner seems to offer a solution of the difficulty. They bled normal healthy dogs into a container holding an anticoagulant. The corpuscles were then centrifuged down and the supernatant plasma drawn off. After washing the corpuscles in physiologic solution they reinfused them into the animals. They repeated this process until they had removed all the plasma from their dogs and had substituted physiologic solution for it. They found no change in the condition of their dogs; they behaved as normal healthy animals.

This method, which Abel, Rowntree and Turner called *plasmapheresis*, has been applied to a few human beings with chronic nephritis, notably by Carstens and by O'Hare, Brittingham and Drinker. Since in chronic nephritis the damage to the kidneys is permanent, as one might expect, no lasting good was done although certain cases showed a transient symptomatic improvement. Eclampsia, on the other hand, is a disease particularly suited to such a procedure. The attack is usually fulminating in nature; the patient is either on the road to recovery or dies within a comparatively short time.

With this situation in mind we decided to apply plasmapheresis to patients entering the hospital in convulsions. In the short time that we have been using this method we have had five such cases, all of whom recovered. In addition we have treated in the same way four individuals with preeclamptic toxemia who did not show a satisfactory fall in blood pressure and amelioration of symptoms following delivery. In one of these cases plasmapheresis was done twice. Five chronic nephritides were thus treated, one of them twice. The chronic nephritides received only temporary benefit although there was a symptomatic improvement and an increase in the urinary output. To date, therefore, we have used the method sixteen times on fourteen patients.

Our method of procedure with eclamptics is as follows: When a patient is admitted in convulsions, she is immediately started on the morphine and chloral routine of Stroganoff, she is blindfolded and her ears are plugged with oiled cotton. There

measures are to lower her threshold of response for external stimuli and thus diminish the likelihood of further convulsions. We then at once carry out a plasmapheresis, the equipment for which is kept constantly sterile and ready. The median basilic vein is cut down upon under local anesthesia while the other arm is used for frequent blood pressure observations. A cannula is inserted through a small incision into the vein and a liter of blood is allowed to run rapidly into a sterile 1000 c.c. graduate, containing the proper amount of sodium citrate solution to prevent clotting. As the blood is running in it is constantly mixed with the citrate by stirring with a glass rod. During the bleeding a marked drop in blood pressure occurs, often as much as 100 mm. of mercury or more, and the patient may present the picture of syncope but no alarm should be felt on this account, and the removal of blood should not be stopped until the full liter is obtained.



Fig. 1.—Removing the plasma.

The circulation above and below the incision in the vein is then temporarily arrested by special smooth faced bulldog clips and a warm salt solution dressing placed over the open wound.

The liter of blood is then divided between four sterile centrifuge bottles each of 500 c.c. capacity so that each one contains about 250 c.c. Each pair of bottles that are to be opposite each other in the centrifuge are balanced on the pans of a torsion balance by adding blood or salt solution to the lighter of the two. This step is necessary to insure smoothness of operation in the machine. Each bottle is now covered with a sterile paper cap and all four are centrifuged for twenty minutes at 5000 revolutions per minute. At the end of this time when the bottles are removed from the machine, it will be seen that the corpuscles have settled at the bottom and that there is a clear supernatant layer of plasma which is equal to half or more of the total volume in each bottle. The plasma is then removed by a sterile siphon of glass tubing, the long arm of which enters a flask through one hole of a two-hole stopper. Through the other hole passes a short tube upon which the operator exerts gentle suction to start the siphon (Fig. 1). The supernatant plasma is removed in turn from each bottle so that nothing is left but the

precipitated corpuscles and the remaining plasma in which they are suspended. In order to remove the bulk of this remaining plasma the corpuscles are washed once. Normal saline solution is added to every bottle until each again contains approximately 250 c.c. Each pair of bottles is balanced as before. The corpuscles are diffused into the saline by gently rotating the bottles and all four are again centrifuged at the same speed for twenty minutes. The supernatant salt solution is then siphoned off. The corpuscles and enough normal saline solution to make up the original 1000 c.c. are placed in a transfusion flask and reinfused into the patient. If we assume that the circulation of the individual under treatment contains about 5 liters of blood we have succeeded by this procedure in removing the toxin contained in the plasma of one liter and have decreased the toxin in the blood by 20 per cent.

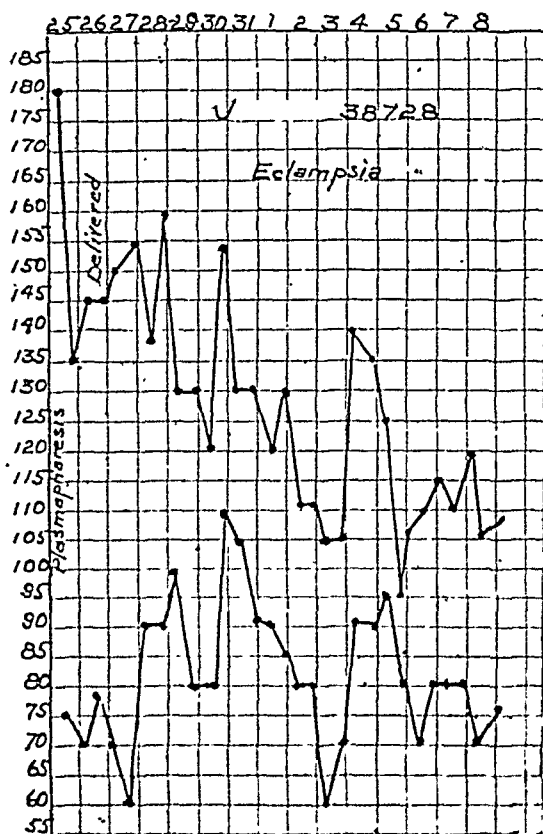


Fig. 2.

The immediate effects and ultimate results of this method of treatment may best be shown by a short account of each case to which it was applied, together with a consideration of the behavior of the blood pressure in each instance.

CASE REPORTS OF ECLAMPSIA

Mrs. J., 38,728, entered in coma having had one convulsion eighteen hours and a second four hours before admission. No fetal heart was heard. The urine contained a very heavy trace of albumin. Following plasmapheresis the blood pressure fell and the patient went into labor and delivered herself of a stillborn infant. Following delivery she became conscious and rational and made a good recovery. (Fig. 2.)

Mrs. McC., 39,215, one week before admission had headache, vomiting, and swelling of the ankles. The day before admission there was blurring of vision, followed by loss of eyesight. A convulsion then ensued which was followed by another in two hours. She entered the hospital with a blood pressure of 170/70 and a heavy trace of albumin. Following plasmapheresis, the blood pressure fell and she started in labor, being delivered fourteen hours later after full dilatation. Save for a transient hemianopia which persisted to the third day she made a good convalescence and was discharged albumin free and with a normal blood pressure.

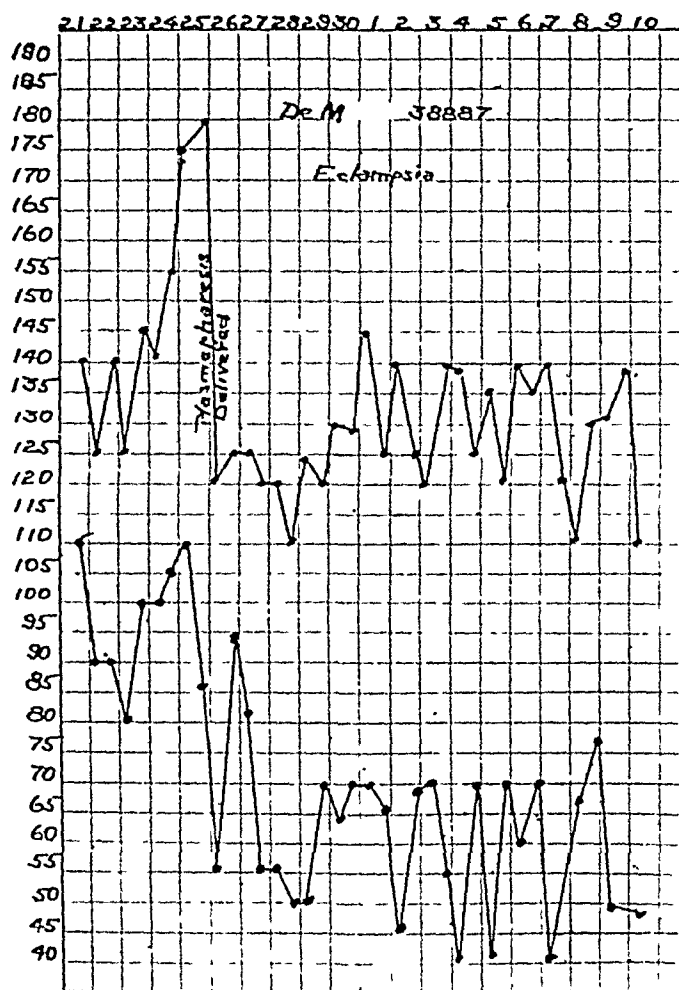


Fig. 3.

Mrs. DeM., 38,887, was admitted with a blood pressure of 140/110 and a large trace of albumin. She had not felt the baby move for over a week, and no fetal heart was obtained on entry. She weighed 294 pounds and had considerable dyspnea with some fluid at the bases of the lungs. Her membranes ruptured spontaneously and she started in labor. An intrapartum convulsion ensued, her pulmonary edema became more extensive and cyanosis was marked. Two ounces of bloody urine were obtained by catheter. A plasmapheresis was done, during which a second convulsion occurred. Following the bleeding and reinfusion, passage of the catheter produced eight ounces of urine which showed only a slight trace of albumin and a few casts. Twelve hours later the patient was conscious, her cyanosis had disappeared and her lungs were clearing. This case is the most satisfactory.

in our series. Although she had only two convulsions, her weight, cyanosis, and pulmonary edema were factors that past experience has taught us to regard as distinctly unfavorable. She was discharged with a negative urine and a normal blood pressure. (Fig. 3.)

Mrs. R., 39,764, was delivered in the out-patient department five hours before admission. One hour after her confinement she had a severe convulsion. On admission a plasmapheresis was done with a satisfactory immediate and final result.

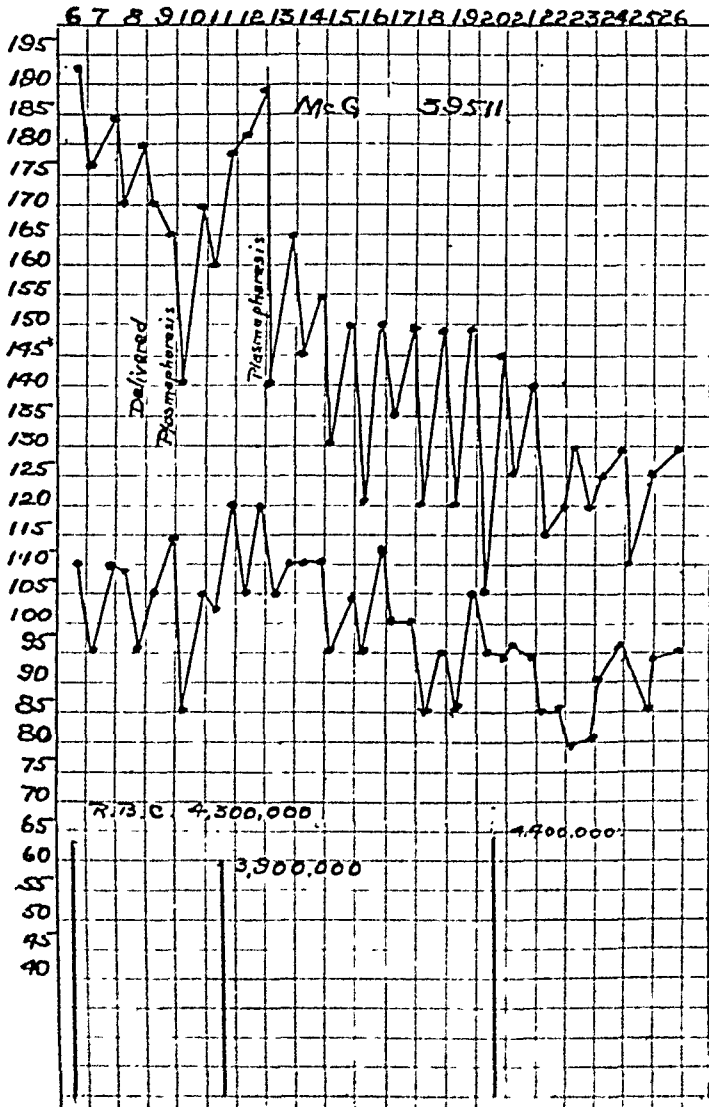


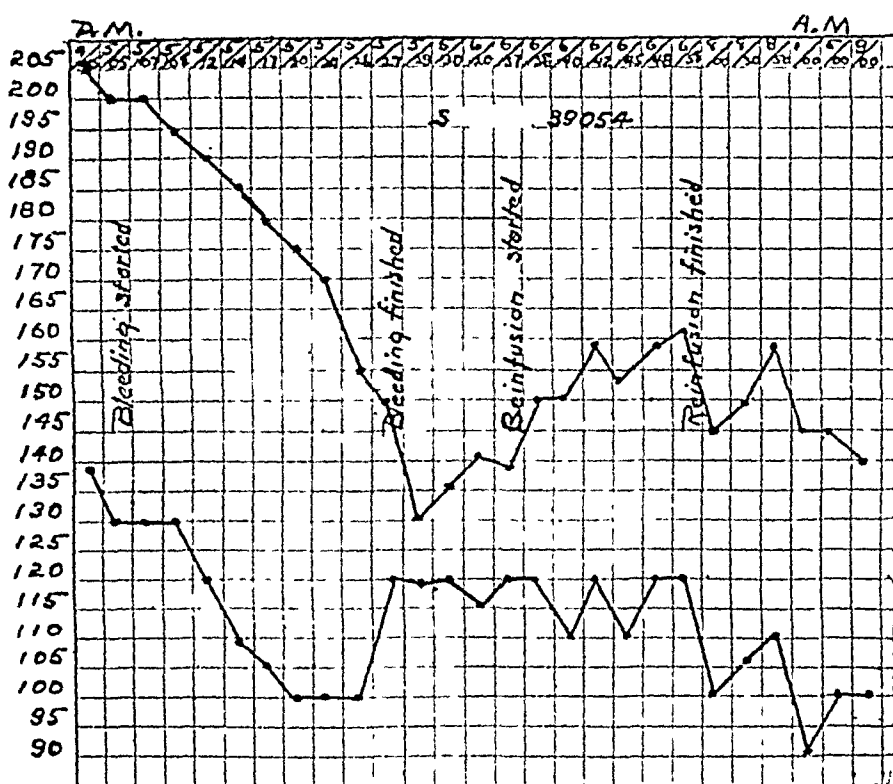
Fig. 4.

Mrs. F., 41,133, was admitted to the hospital from the obstetric clinic with a blood pressure of 140/100 and a large trace of albumin. Forty-eight hours later, since she was at term, labor was induced with castor oil and quinine. During the first stage she had a convulsion which was followed in a few minutes by another. Convulsions then became continuous and were controlled by the administration of chloroform. A plasmapheresis was then done. Two hours later the patient was able to answer questions intelligently. Twelve ounces of urine were obtained by catheter. Progress was uneventful until the fifth day postpartum when the blood

pressure suddenly rose to 170/100 and there was marked disturbance of the sensorium. A second plasmapheresis was done, which was followed by a normal convalescence, the blood pressure was 110/60, and the urine was free from albumin on discharge.

PREECLAMPTIC TOXEMIA

Mrs. M., 38,930, entered in the eighth calendar month of pregnancy with edema and a trace of albumin. Heparhormone, an experimental liver extract designed as a therapeutic agent against toxemia, was used twice without lasting effect. Following induction of labor the blood pressure remained elevated so heparhormone was given again, also without result. A plasmapheresis was followed by a gradual return to normal. A red blood count before plasmapheresis and another before discharge



with this pregnancy, labor was induced. Her systolic pressure rose to 210 but fell following plasmapheresis.

A detailed blood pressure chart of this patient shows a rapid fall during the withdrawal of blood and a low pulse pressure. It will be noted, however, that the blood pressure had begun to rise before the reinfusion of corpuscles and had reached a reasonable level previous to this final step in the procedure. (Fig. 5.)

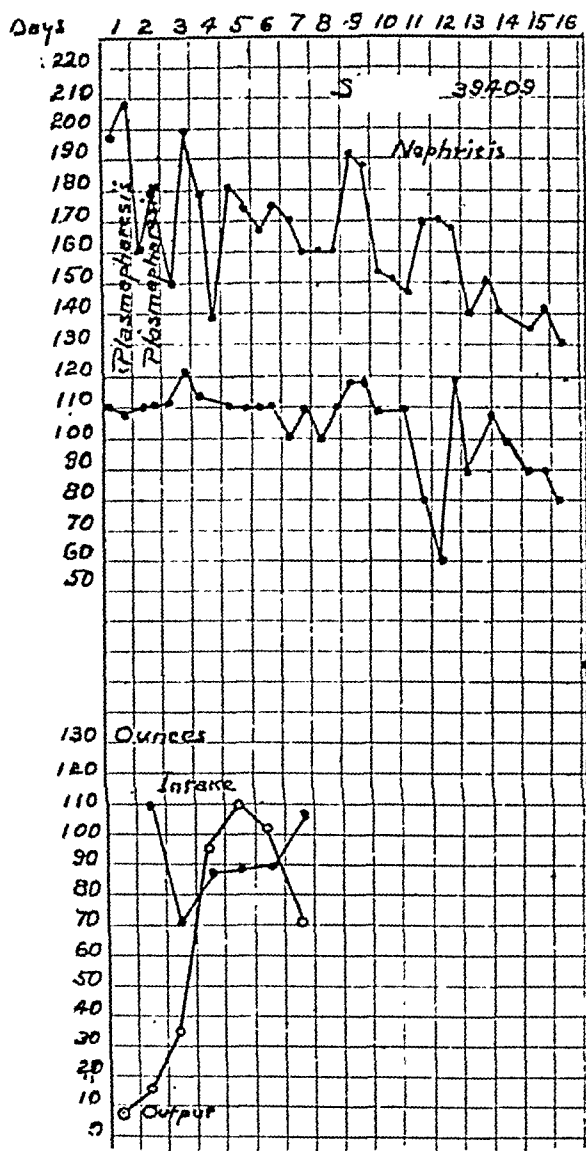


Fig. 6.

NEPHRITIS

Mrs. R., 39,147. In this case plasmapheresis produced only a temporary fall in blood pressure, and labor was induced.

Mrs. S., 39,409, five days before admission complained of headache and dimness of vision. On admission the blood pressure was 150/100, marked albuminuria, much edema and the patient had lost her eyesight. Labor was induced. Two plasmaphereses were done without much result in reducing the blood pressure. There was, however, a marked improvement in the patient's condition. Her vision returned, the edema disappeared, and the urinary output increased. (Fig. 6.)

Mrs. H., 39,831, entered with a blood pressure of 210/150. She went into labor and was delivered normally. Plasmapheresis brought about no marked fall in blood pressure. Eye-ground examination showed degenerative changes in the maculae.

Mrs. M., 39,173, was a primipara with a preexisting nephritis who miscarried spontaneously.

Mrs. Mc., 38,594, had had toxemia in her previous pregnancy. On entry she was put to bed and given the usual eliminative treatment. A plasmapheresis was done in the hope of carrying her to term. She miscarried a macerated fetus. Over half the total area of the placenta was occupied by infarcts.

CONCLUSIONS

1. Sixteen times in fourteen patients a considerable amount of blood had been withdrawn, the plasma removed by centrifugalization and the corpuscles washed and reinfused without untoward effect.

2. In five eclampsies prompt recovery followed.

3. In four cases of preeclamptic toxemia where the blood pressure remained elevated following delivery the use of this method reduced the hypertension and resulted in the disappearance of albumin from the urine.

4. Chronic nephritides have received only temporary benefit. In five such cases there was symptomatic improvement with disappearance of edema and increase in the urinary output.

5. The red blood cells have shown little change in number following this method of treatment.

Since the number of cases treated, particularly those of eclampsia, has been small, this paper should be regarded merely as a preliminary report. We make no claim that this is the best way to treat eclampsia. We believe that the method is logical, and it is our hope that other investigators may employ it on their own account.

REFERENCES

- Abel, Rowntree, and Turner*: J. Pharmacol. & Exper. Therap. 5: 625, 1913-14.
Carstens, Henry: Personal communication. *Gilber, and Tzansk*: Compt. rend. Soc. de biol. 92: 960, 1925. *Lazard*: AM. J. OBST. & GYNEC. 9: 178, 1925. *Moravitz*: Beit. z. Chem. Physiol. u. Path. 7: 150, 1906. *O'Harc, Brittingham, and Drinker*: Arch. Int. Med. 23: 304, 1919. *Stander*: AM. J. OBST. & GYNEC. 9: 327, 1925. *Yourevitch, and Rosenberg*: Russk. Vrach. 14: 637, 1914. *Wilson*: AM. J. OBST. & GYNEC. 9: 189, 1925.

475 COMMONWEALTH AVENUE.

(For discussion, see page 883.)

OBSERVATIONS ON SIXTY CASES OF HYPEREMESIS GRAVIDARUM

BY C. H. PECKHAM, M.D., BALTIMORE, MD.

(From the Department of Obstetrics, Johns Hopkins Hospital and University)

DURING the past few years a great deal has been written on various aspects of severe vomiting of pregnancy. Bokelmann, Harding, Titus, Thalheimer and others have investigated its etiology. Numerous and extremely diversified methods of treatment have been described as the most effective. There is an increasing tendency to attack the problem from the point of view of the chemical findings in the blood, and renewed attention has been directed to clinical changes known for a long time, in the attempt to adduce an explanation. In general it may be said that at present there is no field of obstetric research concerning which more divergent opinions are held, nor is there any syndrome for whose relief more varieties of treatment are recommended.

Because of these divergences of opinion, it has seemed advisable to study carefully the clinical course and laboratory findings in a large series of cases of serious vomiting of pregnancy. For this purpose all patients admitted to the Johns Hopkins Hospital during the period from January, 1920, to December, 1927, with that diagnosis have been considered. The series does not include patients seen only in the Out-Patient Department and followed through the externe service. Incidence, race, age and parity, time of onset of the disease, loss of weight and changes in temperature and pulse are noted. The urine and blood in each case have been subjected to careful chemical analysis. Finally, the various methods of treatment practiced are considered, together with the ultimate result as far as the outcome of the pregnancy is concerned.

During this period of eight years 48 women were sufficiently ill to be admitted to the wards on account of vomiting. Two of the patients had suffered from this condition during two pregnancies, and one during three, thus bringing the total number of cases up to 52. Moreover, six patients had a relapse requiring a second admission during the pregnancy, and one patient was admitted three times, giving a total number of 60 admissions. Thus it appears that in approximately 13 per cent of our patients the vomiting recurred following a previous discharge from the hospital. Of these sixty admissions, thirty-three were classified as suffering from mild and twenty-seven from severe vomiting of pregnancy, as indicated by their condition on admission as well as by their subsequent course in the hospital.

During the years 1924 to 1927 inclusive, there were 6,491 admissions to the house service, and in 43 cases the patient was suffering from vomiting of pregnancy, which in 16 instances was classified as severe. Thus we arrive at a total incidence of 0.66 per cent, and of 0.25 per cent for severe cases; while Cruickshank found in Glasgow a total incidence of 1.21 per cent, and Costa in Spain 0.05 per cent of severe cases. Our figures indicate that vomiting of pregnancy, severe enough to demand admission to the hospital, occurs about once in every 150 pregnancies.

There is a widespread belief that the negro is less prone to conditions in which the neurotic element plays an important part, as it admittedly does in the one we are considering. We, however, find that in our service, which has slightly more colored than white patients, the forty-eight cases were equally divided, with twenty-four in each race. Private patients comprise less than 15 per cent of the total whites, yet ten of the cases of vomiting occurred in such patients. Experience everywhere seems to indicate the prevalence of the condition in the upper rather than in the lower or middle classes.

Age seems to be an unimportant factor. In our series it varied from 14 to 37 years, the average being 24.35 years. Fifty per cent of the patients were between 20 and 24 years inclusive; while 11.5 per cent were below 20, and the remainder were 25 years of age or more.

Eighteen of our patients were primiparae (34.6 per cent). A neurotic predisposition toward vomiting during a second pregnancy was noted in 14 patients (26.9 per cent) and is probably due to a recollection of the discomforts associated with the first illness. Three patients had had six or more pregnancies, with vomiting severe enough to warrant treatment now for the first time in their obstetric career.

The duration of pregnancy at the time of admission to the hospital varied from four to over twenty weeks, the average being 10.42 weeks, and 71 per cent of the patients were under three months pregnant. On the other hand, one patient had two admissions after the twentieth week, and continued to vomit at intervals up to the time of delivery. It is thought that a definite mental disturbance from which she suffered may have played some part in the etiology of the condition.

According to the patients' statements the duration of vomiting prior to admission varied greatly, with extremes of two days to over two months. Seventy-five per cent had been vomiting less than a month. In many instances a satisfactory history could not be obtained, so that it is impossible to state how long the vomiting had persisted before it became severe. In general, however, it may be stated that there seemed to be no connection between the duration of vomiting and the severity of the case nor its response to treatment.

Seven of our patients definitely placed the onset of severe vomiting at less than twenty-eight days following the last menstrual period. In other words, it supervened before the knowledge of the existence of

pregnancy could play any part in awakening mental or neurotic factors. Seventy-one and seven-tenths per cent of the patients began to be definitely ill prior to the sixth week. In only five did it commence after the eighth week, and in only one of these patients was the vomiting severe, and in her case a preceding pregnancy had been terminated elsewhere for the same cause.

The history as to loss of weight often did not correspond with the general physical appearance of the patient and was said to vary from a very slight loss to one of forty-six pounds. As very few of the patients had been long observed prior to their admission to the hospital, reliable data are unavailable. But in six of the twenty-seven patients in whom it was felt that history was fairly trustworthy, the loss of weight apparently exceeded thirty pounds. Strange to say, none of the six were particularly ill on admission, and all of them responded readily to therapy; while the patient who claimed to have lost forty-six pounds did not vomit after admission. Thus our experience indicates that loss of weight gives no index as to the condition of the patient or to the severity of the disease.

The pulse rate at the time of admission was next studied. Twenty patients (33.3 per cent) had a pulse rate below 100. Of these, eighteen required only isolation, suggestion and dietary regulation to effect recovery, and several did not vomit after admission. Fifteen patients (25 per cent) had a pulse of 100 to 120, and in twenty-five (41.7 per cent) it was above 120. The average for the series was 110. Of the six patients in whom the pulse rate rose above 140, five went on to recovery, while in the sixth the pregnancy was terminated. Consequently we do not feel that the presence of a very rapid pulse necessarily justifies a gloomy prognosis. Indeed in one of our most stubborn cases the pulse at no time went above 84.

In patients admitted with a rapid pulse rate, improvement was followed by a fall to normal. All of our patients were discharged with a rate below 100 except two, who left the hospital against advice and before treatment was well under way.

It is generally stated that elevation of temperature is of ominous prognostic import, so that an analysis of our experience may be of interest. Thirty-seven (61.7 per cent) of the cases showed an elevation of sublingual temperature to 99° F. or above, and as in them no local or systemic conditions could be elicited to account for hyperpyrexia, it seems justifiable to connect it in some way with the vomiting. Of the twenty-three patients whose temperature was 99° or below, fifteen, or about two-thirds, could be classified as mild, while of the thirty-seven with some elevation, nineteen, or just over one-half, were severe. Thus it seems that severe vomiting of pregnancy is frequently accompanied by fever (as high as 101° F.); but on the other hand it should always be borne in mind that the patient may be severely ill in its absence.

In only one case was definite jaundice seen. In this instance the patient's condition was so serious as to warrant the induction of therapeutic abortion, which was followed by prompt recovery.

Albumin was present in the urine of 40 per cent of the patients in the series. In eight the test was strongly positive, and three of these women showed definite nephritic toxemia later in pregnancy. Acetone or diacetic acid was strongly positive in only nineteen cases, less than a third of the total, and twelve of these, or 63.2 per cent, came under the classification of mild. On the other hand, in twenty of the severe cases repeated examination of the urine failed to reveal the presence of acetone bodies. Casts were found on microscopic examination of the urine in ten cases, over one-half of which were mild. Thus the ordinary urinary findings gave us very little aid toward determining the severity of the disease.

Study of the nitrogen partition of the urine, as determined by accurate chemical examination, did not give the expected results. The ammonia coefficient, or the relation of the nitrogen excreted as ammonia to the total nitrogen, whether determined at admission or during the worst of the vomiting varied greatly, with extremes of 3.5 per cent to 40.45 per cent, the average for the series being 15.35 per cent, which had fallen to 6.79 per cent on the average at or near discharge from the hospital. In thirteen cases, the ammonia coefficient was below 10 per cent, and eleven of these cases were mild. The other two, however, were so severe that the pregnancy was terminated by the induction of abortion, and these are the only cases in our series which required such radical treatment. Thus a low $\text{NH}_3\text{-N}$ coefficient does not necessarily indicate that the condition is mild. On the other hand the coefficient exceeded 20 per cent in ten patients, and in six of these vomiting was severe but in the other four it was quite mild. Consequently there seems to be a tendency for this factor to follow the severity of the disease, but it can by no means be regarded as an infallible indication.

We now come to a consideration of the changes to be found in the chemical constitution of the blood during serious vomiting of pregnancy. It has been definitely established that certain deviations in the blood chemistry are to be found in normal pregnant women, as contrasted with normal nonpregnant women, although most of the determinations have been made during the last months of pregnancy rather than during the first trimester, concerning which we are particularly interested. From Stander we obtain the following figures:

	<i>NPN</i>	<i>Uric Acid</i>	<i>CO₂</i>
Normal nonpregnant	32 mg.	3.3 mg.	52 vol. per cent
Normal pregnant	28 mg.	3.3 mg.	45 vol. per cent

Likewise Harding, Killian, Caldwell, Farr, P. F. Williams and Plass find the NPN normal or slightly reduced. Harding noted a rise in uric

acid during the latter months, while Killian, Karl and Rowley report the blood sugar within normal limits.

Our figures obtained by blood analysis in several individuals under three months pregnant who showed no signs of vomiting do not differ materially from those just quoted. We find an average NPN of 34.3 mg. per 100 c.c., uric acid 2.4 mg., chlorides 539 mg., sugar 98.3 mg., and CO₂ combining power 49.8 volumes per cent. In other words normal pregnancy, particularly during the early months, seems to cause very little change from the normal in the five constituents of the blood mentioned, with the exception of the sugar, which will be discussed later. On the other hand, as will be indicated, some of them are frequently materially altered during severe vomiting of pregnancy.

Stander, Harden and Guffey, Gonnet and Reboud, and Killian and Sherwin have all found an elevated NPN content of the blood during vomiting, while Dieckmann and Crossen obtained a reading above 60 mg. in three of the ten cases they studied. In our series of sixty cases, forty-nine had one or more determinations of the NPN content of the blood at or soon after the time of admission, with results as shown in the following table:

NPN below 30 mg.	11
from 30 to 39.9 mg.	24
from 40 to 59.9 mg.	5
at 60 mg. or more	9
	<hr/>
	49

Eleven, or 22.4 per cent, showed at no time a figure above 30 mg., the lowest being 16.6 mg. In twenty-four, or 49 per cent, the reading varied between 30 and 39.9 mg. On the other hand in nine of our cases there was a very marked deviation from normal with extremes of from 60 to 150 mg. and an average of 93.8 mg. Eight of these cases were classified as severe and one with a reading of 60 as mild. The average for the entire series is 44.15 mg., or about 10 mg. higher than in the normal early pregnant woman.

The figures obtained by averaging the findings in the mild and severe cases are even more striking. The former showed an average NPN of 33.3 mg. as contrasted with 57.5 mg. in the latter, or more than 23 mg. above normal early pregnancy. We can, therefore, say that mild vomiting of pregnancy has no effect on the NPN, but that severe vomiting definitely tends to elevate it well above normal limits.

There is a similar tendency toward an increase in the blood uric acid. The authors mentioned above as finding an elevated NPN during vomiting also note a corresponding rise in uric acid. J. L. Williams believes an elevated uric acid content of the blood to be indicative of pernicious vomiting, as he did not find it in the neurotic variety. In our series uric acid determinations were made in thirty-nine cases.

Uric Acid below 4 mg.	26
from 4 to 5.9 mg.	7
at 6 mg. or more	6
	<hr/>
	39

Twenty-six, or two thirds of the total number, showed at no time a reading above 4 mg. On the other hand in six cases the figure was above 6 mg., with variations from 6.1 to 10 mg. All the cases in this group occurred among the nine cases referred to above as showing a very high NPN reading. The average uric acid content for the entire series was 4.13 mg., a figure slightly above the upper limit for normal nonpregnant and 1.7 mg. above that observed by us for normal early pregnant women. Upon grouping our figures according as the vomiting was mild or severe, we obtain an average of 3.3 mg. for the former, which is near to but within the upper limit of normal. In the latter, however, the average is 6.1 mg. which is well above normal, and rather parallels the rise in NPN.

Haden and Guffey, as well as Dieckmann and Crossen, report a lowering of the chloride content of the blood in vomiting of pregnancy. Hawk places the limits of blood chlorides in the normal nonpregnant individual at 450 mg. to 500 mg., and Stander in normal pregnant women at term obtains a figure at the upper limit, 502 mg. In our series of normal women during the first trimester of pregnancy even higher results were obtained, varying from 486 to 587 with an average of 539.3 mg. Sixteen of the twenty-two vomiting patients in whom similar determinations were made (72.7 per cent) showed a blood chloride content of 450 mg. or above; while two other patients showed less than 400 mg. In both of the latter the vomiting was severe, and one of them required therapeutic abortion. The average for the series was 480.9 mg. Reverting again to a division according to the severity of the illness, we find in the mild cases an average blood chloride content of 497.2 mg. as contrasted with 464.5 mg. in the severe ones, a figure 75 mg. below that of our normal early pregnant patients but still within the normal limits of Hawk.

The blood sugar in vomiting of pregnancy has given rise to some controversy, but it is difficult to compare the figures of various authors owing to the various methods of determination used and the resulting divergence in figures for normal blood.

During the years covered by our series, the blood sugar was determined by two methods. The Folin-Wu method was used up to Feb. 15, 1926, while after that time and continuing to January, 1928, the modification proposed by Benedict in 1925 was employed. The former method indicated that normal blood contained about 90 mg. per 100 c.c.; while the latter method reduced the figure to 75 mg. This is due to the fact that it did away with the precipitation of certain nonglucose-reducing bodies which were carried over by the Folin-Wu method.

Since January, 1928, we have been employing a third method, Benedict's new modification, which we believe indicates still more accurately the true glucose content of the blood and gives a normal reading of about 60 mg.

Thus during our series two methods of sugar determination were used, each giving a different normal figure—that of Folin-Wu 90 mg. and that of Benedict 75 mg. In order to compare our findings in the two series we have subtracted 15 mg. from the results obtained by the Folin-Wu method, and consequently all our figures are given in terms of the 1925 Benedict method with its normal of 75 mg. Our small series of normal early pregnant patients shows a high average blood sugar, 98.3 mg. per 100 c.c. (Benedict). This was an unexpected finding and there is no obvious explanation for it. We believe that more work should be done on this point, as our series is too small to justify a definite statement.

Dieckmann finds a normal blood sugar in the vomiting of pregnancy. Grogan agrees but reports an occasional case in which the sugar is lowered. On the other hand Long, as well as Kuto, finds a hyperglycemia, the latter in eleven cases obtaining an average of 143 mg. Titus, on the contrary, contends that severe vomiting of pregnancy is always accompanied by a definite hypoglycemia.

Our figures obtained from patients suffering from vomiting varied from 67 mg. to 200 mg.

Blood Sugar (Benedict—normal 75)	below 80 mg.	3
	from 80 to 99 mg.	8
	from 100 to 119 mg.	12
	from 120 to 139 mg.	9
	at 140 and above	6
		<hr/> 38

The three readings below 80 occurred in mild cases, whereas the six patients in whom the blood sugar rose above 140 all belonged in the severe group, and included the two upon whom abortion was practiced. In general, it may be said that two-thirds of the patients with severe vomiting had a sugar above 100; while in over half the mild cases it never rose to that level. The average for the whole series was 112.1. Stated in another way, it may be said that the blood sugar in the patients classified as mild averaged 97.8 mg. per 100 c.c., which may be regarded as a good check upon the figure obtained in normal early pregnant women. The fifteen patients with severe vomiting gave an average of 134.1 mg., and in six of them the blood sugar rose above 140 mg. It appears to us that such findings suggest a markedly perverted carbohydrate metabolism whose nature is not yet understood.

The effect of vomiting of pregnancy on the CO_2 combining power of the blood is also not agreed upon. Grogan finds it low, while Haden

and Dieckmann report it increased. Considerable variation in the figures obtained by us likewise occurs.

CO ₂ Combining Power	under 40 mg.	4
	from 40 to 59 mg.	40
	from 60 to 79 mg.	4
		<hr/>
		48

Four patients had readings below 40 per cent, three of whom were severe; while on the other hand, four patients had a CO₂ combining power of over 60 volumes per cent and three of them were severe. Such observations make definite conclusions impossible, as they appear to indicate that both patients with and without acidosis may be equally ill. Both the mild and severe cases gave an identical average of 48.3 volumes per cent, which is essentially that of the normal controls—49.8 volumes per cent.

The treatment employed on our patients varied considerably, but isolation from friends and relatives was routinely practiced and was usually so rigid as to exclude mail, papers, and flowers. Constant reassurance and a refusal on the part of all coming into contact with the patient to consider her condition in any way serious was also routine. Preliminary starvation for from twenty-four to forty-eight hours was often practiced; the diet varied—liquid, soft, amplified, high carbohydrate, and small frequent meals have all been used. At the onset of therapy glucose or tap water per rectum, subpectoral isotonic saline infusions, and nutrient enemata have occasionally been used. A certain number of cases have received glucose intravenously with or without insulin. In the majority of cases the kind of treatment seems to make little or no difference provided isolation and reassurance are stressed. Twelve of our patients who had vomited constantly at home did not regurgitate once after being put to bed in the hospital. Some of these gave a lengthy history of vomiting and had obviously lost much weight.

For some time we have been using a routine essentially similar to that employed at the Boston Lying-In Hospital. The patient is put to bed in a private room and isolated. She is carefully questioned as to fears or troubles calculated to upset her psyche, a careful physical examination is done to rule out other causes for the vomiting, and she is reassured to the point of the physician making light of her condition. If the patient is much dehydrated she is given tap water per rectum or an infusion. Nothing is given by mouth for twenty-four to thirty-six hours. At the end of that time she is given at hourly intervals from 9 A.M. to 9 P.M. a glass of some fluid, alternating at least three varieties. Milk, chocolate, ginger ale, orange juice, strained broth and other liquids may be used, being guided by the patient's preference if she can be persuaded to state any. During this time the emesis basin,

glasses, and other receptacles are removed from the room, and the nurse enters only at hourly intervals to bring the next ration. Vomiting usually ceases after the first day, rarely does it continue longer than two days. As soon as it is apparent that vomiting has ceased, the patient is placed upon six small meals per day and unlimited fluids, again being consulted as to her desires. She is usually sent home on this diet with orders to report frequently for examination. Our results with this treatment, which has now been in use over eighteen months, have been extremely gratifying.

In our series of fifty-two cases of vomiting of pregnancy all but four have terminated satisfactorily. Two patients were uncooperative and left the hospital against advice shortly after admission. Two patients failed to respond to therapy and abortion was induced. In one instance interference seemed indicated on the basis of a marked nitrogen retention. This patient has since been under our care in two subsequent pregnancies, in each of which similar chemical and clinical findings were noted and ended in spontaneous recovery, so that it may well be that the abortion was unnecessary. The other patient was observed for ten days during which time all types of therapy were employed, including bidaily administration of glucose intravenously. Jaundice developed, and her condition became so critical that abortion was done. The next day solid food was retained, and within a week the patient gained sixteen pounds.

We have been able to follow thirty-nine of these patients to the termination of the pregnancy. Twenty-seven were delivered at term, three of them having toxemias during the latter months of the pregnancy. In two, as stated above, therapeutic abortion was done. Ten patients, or 25.6 per cent, aborted spontaneously at varying intervals after leaving the hospital; a surprisingly large number for so small a series. Of these ten patients one had a complete abortion at home, while the other nine were admitted to the hospital. The specimens obtained from the latter were all subjected to careful microscopic examination. One was a typical hydatidiform mole. Three others showed definite inflammation of the decidua and chorionic membrane. The remaining showed no abnormality to account for the abortion. In the decidua of one specimen, deportation of villi was seen.

DISCUSSION

Despite the large number of women suffering from nausea and vomiting during the first trimester of pregnancy very few develop the pernicious type and require hospitalization. The upper classes contribute a much larger percentage than the lower types of white women; and in general it may be said that colored women are more apt to be afflicted than white women of the same social status. The incidence seems to

be greater in a warm than in a cold climate. Germany and the British Isles are said to have a very low incidence. Several of our white ward patients were of French or Italian extraction. A rather large percentage of patients returned to the hospital following a relapse, but none of these were private patients. Crowded ward conditions necessitate the early discharge of the public patient, in this series often within a week of cessation of vomiting. Two weeks would probably give more lasting results, and if the financial condition of the patient permitted, an intermediary sojourn at some resort between hospital and home would seem to be beneficial.

It is believed in this clinic that the underlying basis for every case of vomiting of pregnancy lies in a toxemic process. This is based upon the fact that in every pregnancy, whether normal or not, histologic evidence can be adduced to show that fragments of chorionic villi and detached masses of chorionic epithelium can be demonstrated in the maternal vessels. In other words there is an invasion of the maternal blood by fetal elements. Normally this foreign protein is broken down by the tissues of the mother and is rendered innocuous. On the other hand, if the process be interfered with, it seems justifiable to suppose that toxic symptoms may develop.

In the majority of cases this leads to few or no clinical manifestations so long as the nervous equation of the mother is in fair equilibrium, but when it is unstable symptoms follow. Consequently, in most such cases nature is able to care for the underlying toxemia if the mental condition can be alleviated. This affords a rational explanation for the satisfactory results attending treatment by isolation and suggestion and justifies the employment of the term neurotic vomiting in clinical parlance. At the same time it must always be remembered that this is a clinical conception and that the underlying cause is always to be found in a toxemic process.

On the other hand in rare instances the underlying toxemia is so intense that such treatment is useless, as organic changes soon develop which will inevitably lead to death if the pregnancy is not interrupted. In exceptional cases in this category the fatal issue may occur within one week, and these represent toxemic vomiting par excellence. Furthermore, when death occurs after an illness lasting for weeks, it is usually attributable to changes consequent upon dehydration and inanition, rather than to lesions directly dependent upon the toxemic process.

A great majority of the cases gave as the time of onset before the eighth week of pregnancy. Seven patients began to vomit before a menstrual period had been missed. It is rather difficult to conceive of a neurotic element causing the onset of trouble in these cases.

A very rapid pulse cannot be used per se as an indication for abortion. A critically ill patient may have a steady pulse below 90. On

the other hand a patient with a pulse above 140 is likely to respond quickly to therapy.

Some temperature elevation is frequently observed, falling to normal as improvement is noted. Body dehydration probably accounts for this finding, very few of the mild cases showing any hyperpyrexia.

Albumin is frequently present in the urine of these patients. It seems to be an unimportant factor, being seen as often in mild as in severe cases. It promptly clears up as the patient improves, and in no undue number of cases is a toxemia observed later in the pregnancy. Acetone and diacetic acid were strongly positive in the urine of only one-third of our cases. Many severe cases with dehydration and a lengthy history of vomiting failed to show the presence of acetone bodies on repeated urinary examinations.

The ammonia nitrogen percentage in the urine is definitely increased in almost all cases of starvation and only in a very small number of cases is an indication of the existence of a severe toxemia. Very high readings usually go with a severe case but by no means indicate a gloomy prognosis. On the other hand our only two cases requiring termination of pregnancy at no time had an NH_3N percentage of over 10.

COMPARATIVE BLOOD CHEMISTRY

	NUMBER OF CASES	NPN	URIC ACID	CHLORIDES	SUGAR	CO_2
Normal Early Pregnancy	7	34.3	2.4	539.3	98.3	49.8
Vomiting (Mild)	33	33.3	3.3	497.2	97.8	48.3
Vomiting (Severe)	27	57.5	6.1	464.5	134.1	48.3

The blood chemistry undergoes marked and rather characteristic changes in severe vomiting of pregnancy. In the mild cases the non-protein nitrogen is unaffected; in severe ones it is definitely elevated, not infrequently over 100 mg. per 100 c.c. A slight elevation of blood uric acid is noted in mild cases of vomiting over that of normal early pregnant women. In severe cases, however, it tends to be very high, corresponding closely to the rise in NPN. A fall in blood chlorides is noted in mild cases, increasing as the case is more severe. A very low reading seems to indicate a very ill patient. Normal salt solution subpectorally or intravenously seems to improve the condition of such patients. The blood sugar is unchanged in mild cases but is definitely elevated in severe ones. No essential change in the carbon dioxide combining power of the blood is noted in either type.

The explanation of these findings is not evident. Blood concentration due to dehydration might account for the high values for NPN, uric acid, and sugar. Liver damage would seem to be indicated by the high uric acid, while an upset carbohydrate metabolism, again possibly

from liver damage, would well cause the hyperglycemia. A tendency to acidosis resulting from a changed hydrogen-ion concentration of the blood due to the continual emesis of the HCl of the gastric juice is the most probable explanation of the lowered chloride content. These changes are apparently the result rather than the cause of the vomiting, since they are not usually present in the milder type of case.

The variety of treatment in the great majority of cases matters little so long as isolation and psychotherapy are stressed. It must be remembered, however, that the occasional case will respond to nothing, but represents a profound toxemia, is associated with changes in the liver similar to those noted in acute yellow atrophy and will require termination of the pregnancy, and that a change for the worse in these cases may come very quickly. We must constantly be on the watch for such cases and must avoid the danger of considering all patients merely neurotic individuals who will eventually recover.

Finally, it appears that a large number of these cases end in spontaneous abortion. It would seem possible that in these cases improvement was coincident with the death of the fetus. However, from the length of time the abortion followed discharge from the hospital, as well as the microscopic appearance of the specimen obtained, this would not seem to hold true in most of our cases.

CONCLUSIONS

1. Vomiting of pregnancy sufficiently severe to warrant admission to a hospital occurs about once in one hundred and fifty pregnancies, and severe cases occur once in four hundred.

2. Women in the upper walks of life are more prone to the disease, but negro women are not immune to it.

3. The age and parity are not predisposing factors.

4. Severe vomiting usually starts before the eighth and occasionally before the fourth week of pregnancy.

5. Neither the time of onset, duration of vomiting, nor loss of weight indicates the severity of the disease nor affords a safe guide for prognosis.

6. A high pulse rate usually indicates severe vomiting but does not necessarily imply a serious prognosis. On the other hand a low pulse may persist in a severely ill patient.

7. Fever due to dehydration is frequent.

8. The presence of urinary albumin is frequent but is of slight prognostic importance.

9. Acetone bodies are frequently absent from the urine in severe cases.

10. A high ammonia coefficient is usually seen, but a low one does not necessarily indicate a mild case.

11. In mild vomiting of pregnancy the blood chemistry is not essentially changed, although the uric acid tends to rise and the chlorides to fall.

12. In severe cases a definite increase in NPN, uric acid and sugar is usually noted in the blood. The chlorides are often considerably lowered.

13. In most patients isolation in a hospital and suggestive treatment will effect a cure, but exceptionally all therapy fails and the induction of labor is indicated.

14. A considerable percentage of patients abort spontaneously some time after cessation of symptoms, a phenomenon which requires explanation and study.

BIBLIOGRAPHY

- Benedict, S. E.*: J. Biol. Chem. 64: 207, 1925; 76: 457, 1928. *Caldwell, W. E., and Lyle, W. G.*: AM. J. OBST. & GYNEC. 2: 17, 1921. *Calkins, L. A.*: South. M. J. 21: 202, 1928. *Costa, N.*: Semana med. 1: 180, 1927. *Cruickshank, J. N.*: J. Obst. & Gynec. Brit. Emp. 30: 541, 1923. *Davis, C. H.*: Wisconsin M. J. May, 1920. *Dieckmann, W. J., and Crossen, R. J.*: AM. J. OBST. & GYNEC. 14: 3, 1927. *Farr, C. B., and Williams, P. F.*: Am J. M. Sc. 147: 556, 1914. *Folin, O., and Wu, H.*: J. Biol. Chem. 41: 367, 1920. *Gonnet and Reboud*: Bull. Soc. d'obst. et de gynec. 16: 472, 1927. *Grogan, R. L.*: Texas State J. Med. 23: 392, 1927. *Haden, R. L., and Guffey, D. C.*: AM. J. OBST. & GYNEC. 8: 486, 1924. *Harding, V. J., and Duncan*: Lancet, 327, August, 1921. *Harding, V. J., Allin, K. D., and Van Wyck, H. B.*: J. Obst. & Gynec. Brit. Emp. 21: 595, 1924. *Harding, V. J., and Van Wyck, H. B.*: AM. J. OBST. & GYNEC. 10: 1, 1926. *Karl, H.*: Arch. f. Gynäk. 129: 323, 1926. *Kennedy, R. B.*: J. Michigan M. Soc. 26: 563, 1927. *Killian, J. A., and Sherwin, C. P.*: AM. J. OBST. & GYNEC. 2: 6, 1921. *Kuto, F.*: Kinki Jujinkwa Gakkwai Zassi 9: 24, 1926. *Lentz, E.*: Ztschr. f. Geburtsh. u. Gynäk. 92: 198, 1927. *Plass, E. D., and Matthew, C. W.*: AM. J. OBST. & GYNEC. 12: 346, 1926. *Rathery, F., and Julien, M.*: Bull. et Mem. Soc. méd. de hôp. de Paris 43: 842, 1927. *Rowley, W. N.*: AM. J. OBST. & GYNEC. 5: 23, 1923. *Schwab, M.*: Ztschr. f. Gynäk. 45: 956, 1921. *Stander, H. J.*: Bull. Johns Hopkins Hosp. 35: 133, 1924. *Stander, H. J., Duncan, E. E., Sisson, W. E.*: Ibid 36: 411, 1925. *Titus, P.*: J. A. M. A. 85: 488, 1925. *Williams J. L.*: J. A. M. A. 77: 1297, 1921. *Williams, J. W.*: J. Obst. & Gynec. Brit. Emp. 22: 245, 1912. *Williams, P. F.*: Am. J. Obst. 69: 614, 1914.

A COMPARISON OF BLOOD CALCIUM LEVELS BETWEEN AND DURING MENSTRUAL PERIODS

BY EDWARD ALLEN, S.B., M.D., F.A.C.S., AND H. C. GOLDTHORPE, PH.D.,
CHICAGO, ILL.

*(From the Departments of Obstetrics and Pathology of Rush Medical College and
Presbyterian Hospital)*

RECENTLY¹ we presented a preliminary paper on the use of parathyroid hormone in the control of idiopathic menstrual bleeding. Continuing this work we found it necessary to obtain a basis for comparison of plasma calcium levels in normal women. These results form the basis for this report.

It seemed quite logical to assume that the menstrual period should cause a rise in the blood calcium since various investigators^{2, 3, 4, 14} report an elevation during pregnancy or lactation in women and during estrus in animals.

There are many reports, beginning with the work of Bell⁵ in 1909, that record a rise in blood calcium at menstrual time. The results obtained by Shorlit et al.⁶ seemed to indicate that the blood calcium rises just preceding the onset of the menstrual period. Watchorn⁷ reports an increase of serum magnesium in a menstrual period associated with pain but no change in the blood calcium. Rittmann⁸ in his series reports a calcium variation in 83 per cent of cases.

Determinations of the blood calcium in practically all of these reports were made on specimens of blood drawn at various times throughout the monthly cycle and particularly during the menstrual flow.

METHODS

When we began our work, using nurses with normal menstrual periods, we followed the usual procedure of drawing blood at weekly intervals until the onset of menstruation and then each day during the menstrual flow. Approximately 10 c.c. of blood was drawn from the median basilic vein and prevented from clotting by the addition of a small amount of heparin. The blood was centrifuged and the calcium determined on the plasma by the Tweedy⁹ procedure. All of the determinations were made by one of us (H. C. G.) to reduce individual error. Practically all of the beginning samples were run in duplicate and checked within 0.05 mg. Many of the later and most important specimens were also checked in this manner.

In the beginning it did not seem feasible to obtain the blood from a fasting subject. In these instances the blood was withdrawn just before the noon meal. The results appear less variable than those obtained later in the fasting subject.

Fifteen nurses volunteered for the first group of our experiments. They were all supposed to have regular twenty-eight day type men-

strual periods. We soon found that about 30 per cent of those who had supposedly been regular varied as much as seven days in the onset of flow.

In a second group of experiments these results were compared with the values obtained in:

a. Two additional nurses from whom blood was drawn every day from the beginning of one menstrual period to the end of the succeed-

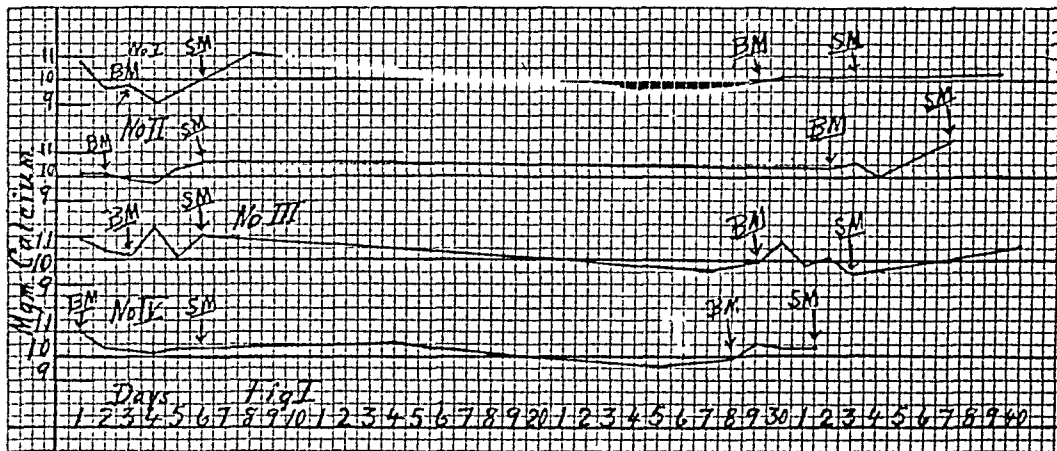


Fig. 1.—Graphs of the results on four of the first group of fifteen nurses in which calcium values were determined at weekly intervals during intermenstrual period and daily during menstrual flow. The interim between samples is an important factor in the type of these curves. B.M., began menstruation. S.M., stopped menstruation. The base line 10 is taken as number of milligrams of calcium per 100 c.c. of plasma.

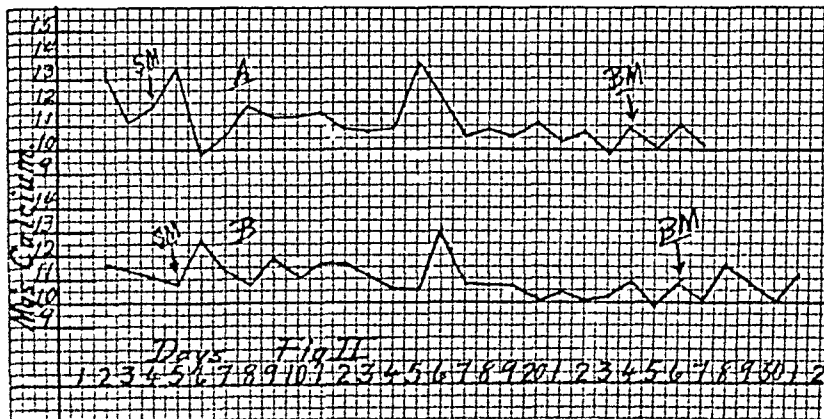


Fig. 2.—The variations in these graphs follow one another closely although the onset and the end of menstruation are not synchronous.

ing menstruation. The blood was taken just before their noonday meal.

b. Two new volunteers who gave blood before breakfast throughout the monthly cycle.

c. One young woman who had been amenorrheic for one year but began to menstruate later, following thyroid administration.

d. Blood drawn from each of the authors' veins at 11 A.M., at periods varying from one to seven days, for thirty-five days. In all about 450

determinations were made. The hemoglobin was determined by the Newcomer method on alternate days in all of these donors. None of them gave evidence of the loss of blood.

RESULTS

When we examined the four typical graphs (Fig. 1) taken from the first group of fifteen normally menstruating women, we were impressed by the following points: First, the interim between the samples seems to determine the general contour of the graph and might readily ex-

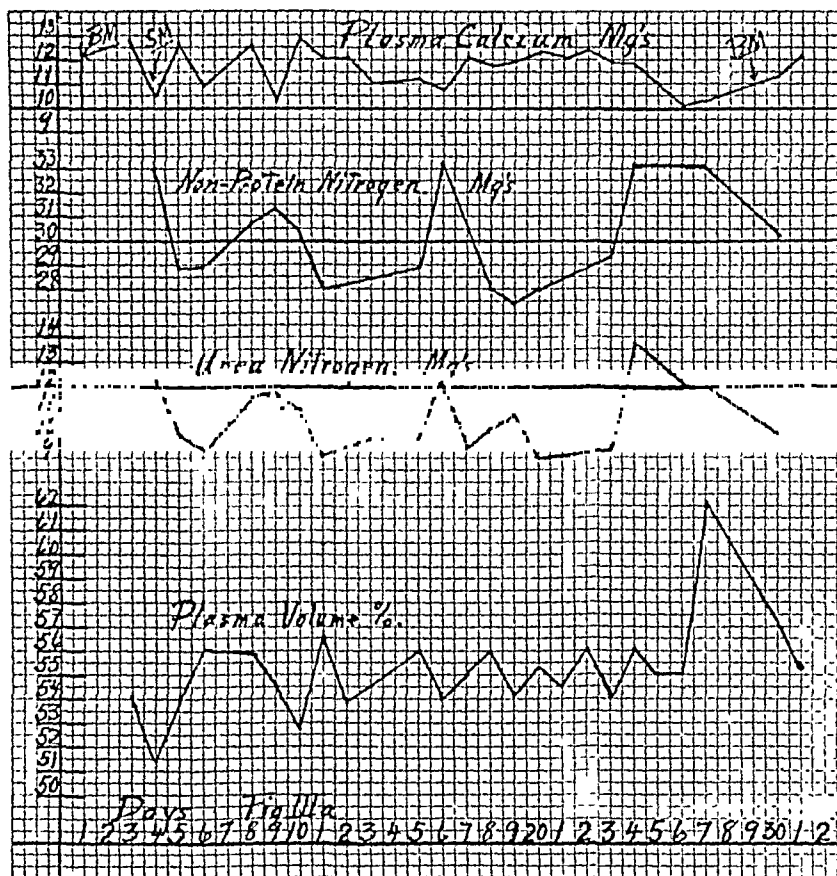


Fig. 3-A.—The graph of plain dots above the base line 10 represents the calcium values. That of the circle dots the urea. The center graph illustrates the variations in nonprotein nitrogen while the lower circle dot graph represents the plasma volume of the blood in per cent. Fifty-five per cent is chosen as the mean for a base line.

plain the difference in opinion of various investigators concerning a rise or fall of the blood calcium before, during, or after a menstrual flow. Second, the results obtained in the first menstrual period study do not correspond to those obtained during the following menstrual flow.

The graphs in Fig. 2 represent the specimens which were taken at 11 A.M. Both patients began to menstruate on the same day. There was two days' difference in the onset of the next period and one day's difference in the duration of bleeding. These determinations were

made during March and April. There is a marked similarity in the curve of the graph although the menstrual period does not seem to definitely affect the variations. The marked variation occurring on the fourteenth and fifteenth days gave us room for speculation. We tried at first to connect it with the period of ovulation. Riddle and Reinhart¹⁰ have shown a comparable rise in pigeons at ovulation time or about 108 hours before the beginning of shell formation. Our next series, however, did not bear this out. We concluded that this, along with the minor variation, must be due to some outside factor that was

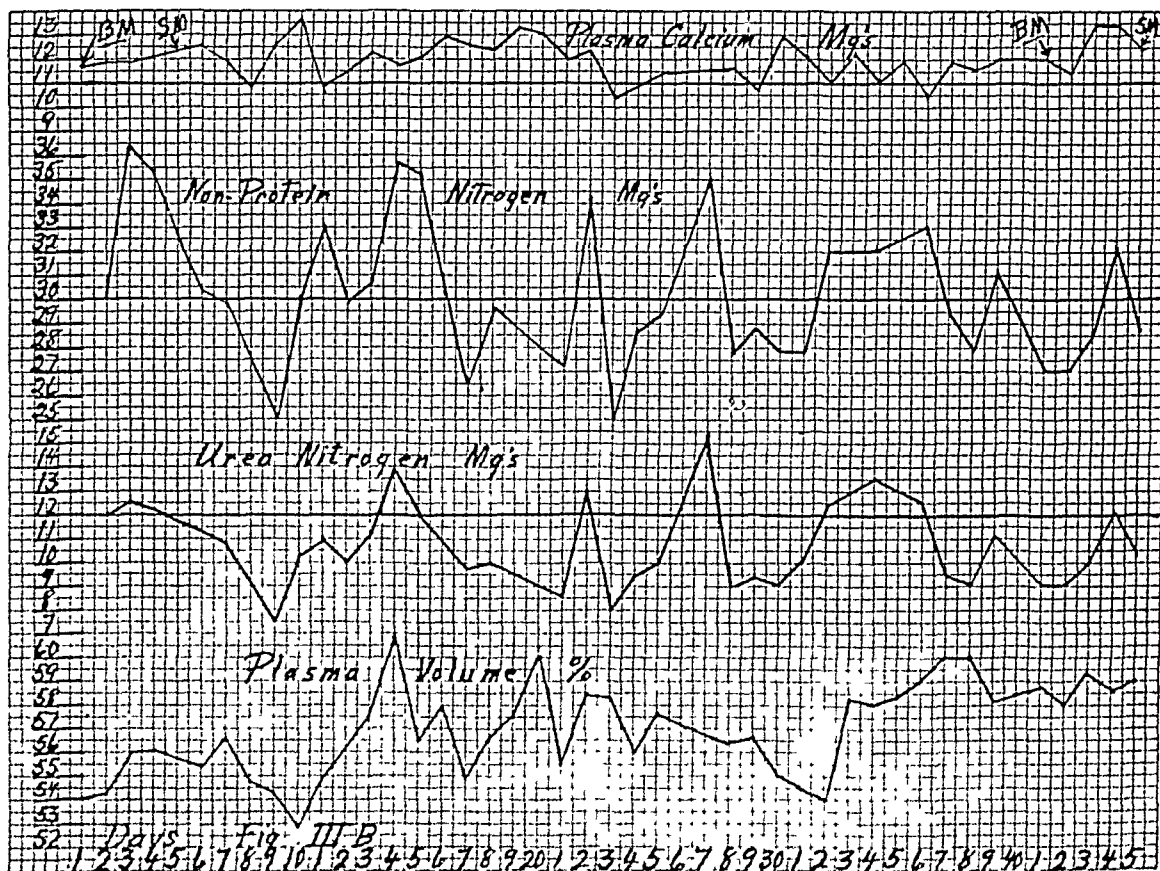


Fig. 3-B.—This graph illustrates the values obtained upon the second young woman of this group. The values and base lines are the same as for Fig. 3-A.

influencing both individuals or their samples of blood alike. Four possible factors were taken into consideration: (1) experimental error, (2) diet, (3) influences such as temperature, sunlight, and barometric pressure, and (4) variations in the concentration of the blood.

In the next group of tests conducted on two new volunteers from whom blood was withdrawn before breakfast, we attempted to check these variations. These two young women also began to menstruate on the same day. The periods studied occurred during September and October. One of them (Fig. 3-A) began to menstruate again twenty-five days after the onset of the previous menstrual period (Fig. 3-B). The intermenstrual period in the other was thirty-nine days.

Enough blood was withdrawn in these subjects to enable us to also determine the urea and nonprotein nitrogen. The irregularities in the graph representing these two substances follow each other very closely but do not correspond with the graph for the serum calcium. Greater variations in the calcium values were present in these specimens taken on a fasting subject than those taken at 11 A.M. In three out of the four periods charted, the calcium was higher at the end of menstruation than at the beginning. The rise and fall of the calcium values follow very closely the variations in the concentration of the blood.

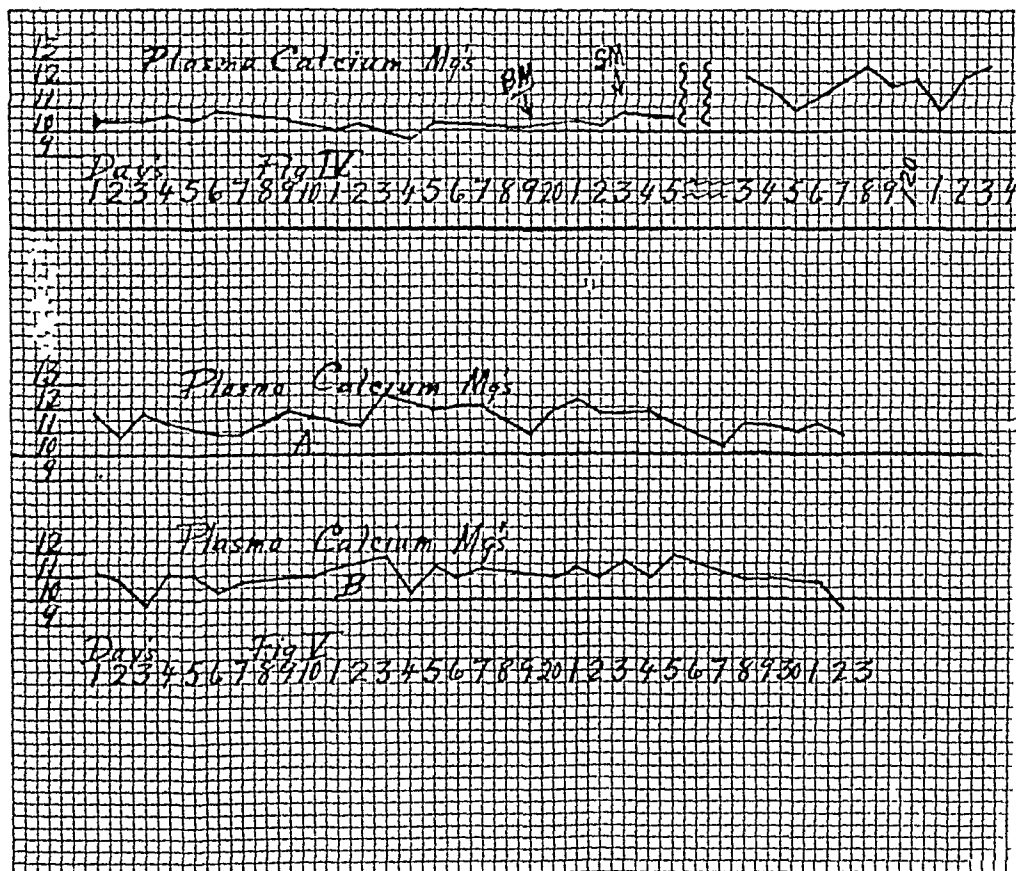


Fig. 4.—Values obtained in the patient who menstruated after thyroid therapy. The break in time is indicated by two parallel lines.

Fig. 5.—Graphs representing variations in the authors' blood calcium over a period of thirty-five days.

The chart (Fig. 4) drawn from the values obtained on the case of amenorrhea is extremely interesting. This young woman had not menstruated for one year preceding this experiment. She had had a normal menstrual history before she came to enter her nurses' training. During the year she had gained forty pounds in weight. Her basal metabolic rate was -8 . She was given thyroid gr. ii each day and eighteen days later began to menstruate. The thyroid medication was stopped. The patient had lost fifteen pounds. The calcium values for this period are shown preceding the break indicated by two lines. This

blood was drawn during November and December. The patient did not menstruate again until April and then only after a second course of thyroid medication.

In comparing these two periods we find: (1) The average value for the first division is much lower than that taken during the second period. (2) The individual variation in the first group is much smaller than that of the second. (3) The menstrual period in the first group does not seem to affect the blood calcium at all, while the flow in the last half is associated with considerable variation. (4) The relatively constant values obtained in the first portion of the graph would speak against experimental error as the cause of larger variations in the other subjects. (5) The variations of the second portion of the curve correspond with the period of greater climatic variation.

The blood that we drew from our own veins revealed essentially the same, although not quite as marked variations as any of the young women. The blood was drawn during January and February (Fig. 5).

The Bakwins¹¹ have shown a seasonal variation in the calcium content of the serum in infants.

Grayzel and Miller¹² believe that exposure to ultraviolet light will lower the intestinal phosphorus in dogs and thus favor the absorption of calcium.

Grant and Gates¹³ found low calcium values in the blood of rabbits during January and high calcium during May and November.

CONCLUSIONS

1. The present methods of blood calcium determination do not reveal an appreciable or constant effect of the normal menstrual period on the calcium content of the blood.

2. Plasma calcium values between 9.3 and 13.6 gm. per 100 c.c. are normal in young healthy women.

3. The most probable reason for these differences is to be looked for in seasonal or climatic changes (being slightly higher in spring and summer) and variations in the concentration of the blood.

We wish to express our appreciation to the nurses and their Training School for their hearty cooperation in this work.

REFERENCES

- (1) Allen, Comper, and Austin: *AM. J. OBST. & GYNEC.* 13: 156, 1927. (2) Luckhardt and Goldberg: *J. A. M. A.* 80: 79, 1923. (3) Grunwald, Isidor: *J. Biol. Chem.* 47: 1, 1926. (4) Widdows: *Biochem. J.* 17: 34, 1923. (5) Bell and Hick: *Brit. Med. J.* 1: 517, 1909. (6) Shortlit, Corscadin, and Lyle: *Arch. Int. Med.* 39: 780, 1927. (7) Watchorn: *Brit. J. Exper. Path.* 7: 120, 1926. (8) Rittmann: *Wien. Arch. f. Inn. Med.* 8: 1924. (9) Twcedy: (To be published.) (10) Riddle and Reinhart: *Am. J. Physiol.* 76: 660, 1926. (11) Bakwin, Harry and E. M.: *Am. J. Dis. Child.* 34: 994, 1927. (12) Grayzel, D. M., and Miller, E. J., Jr.: *Proc. Soc. Exper. Biol. & Med.* 24: 668, 1927. (13) Grant, J. H. B., and Gates, F. L.: *Proc. Soc. Exper. Biol. & Med.* 22: 315, 1925. (14) Dragstedt, Lester, R.: *Physiological Reviews* 7: No. 4, 1927.

THE SLOANE HOSPITAL FOR WOMEN; ITS DEVELOPMENT, SIGNIFICANCE, AND POSSIBILITIES*

BY J. WHITRIDGE WILLIAMS, M.D., BALTIMORE, MD.

I AM delighted to speak on this occasion because I have many associations with the Sloane Hospital. In the first place its history is almost exactly coterminous with my own medical life, as the original building was opened for the reception of patients on Jan. 1, 1888, while I received my doctor's degree three months later (April 17). In the second place I have known personally each of its four successive heads and have been on terms of intimacy with the last three.

On this occasion I shall begin my remarks with a brief reference to the condition of obstetric education in this country prior to my graduation and then indicate the significance of the foundation of the Sloane Hospital. After that I shall say a few words as to its history, shall recall some of my recollections of its several heads and their early associates, and finally I shall conclude by advancing the somewhat iconoclastic proposition that possibly we have not advanced so very far during the past generation and that certain of our so-called advances have not contributed to medical knowledge, or greatly to the well-being of those committed to our care.

It is difficult for those who have recently entered the field of obstetrics and gynecology, and especially for those who have received their training in the well-equipped clinics of Boston, New York, Philadelphia, Baltimore, Chicago, St. Louis or San Francisco, to realize how recent such foundations are, or to visualize the conditions which existed prior to their establishment.

During the one hundred years intervening between the first course on obstetrics given by William Shippen in Philadelphia and the opening of the Sloane Maternity, no essential change had occurred, and nowhere was opportunity afforded to ambitious young men to obtain such knowledge of practical obstetrics as can be gained only by a prolonged service in a large lying-in hospital under competent leadership. From time to time small lying-in hospitals were established in various communities, but they were not intended for the training of doctors but rather as asylums for poor and respectable married women. It should be recalled that the introduction of clinical teaching in obstetrics by James P. White of Buffalo in 1850 gave rise to great excitement and to such bitter criticism that he was compelled to resort to the courts in order to protect his reputation. Some idea of the prevailing state of mind may be gained by recalling that several of the medical witnesses

*Read before the Society of the Alumni of the Sloane Hospital, November 16, 1928.

at the trial testified that such instruction was unnecessary, and even if it were that all its essentials could be obtained from watching the delivery of cows or sheep in a barnyard. And yet all that White attempted was to demonstrate the process of delivery before his class but without giving its members any opportunity to examine the patient.

Consequently while there had been numerous fluent, and even eloquent, teachers of obstetrics during that period, their instruction consisted entirely of didactic lectures, with the result that students who desired to perfect themselves in that branch were compelled to go to Europe.

It is generally believed that the first lying-in hospital in this country intended primarily for the training of students was established by the College of Physicians and Surgeons of Baltimore in 1822. It, however, was a small, makeshift affair, installed in a private house, and disappeared after a precarious existence. A similar institution was opened by the University of Maryland in 1887, and it was there that I witnessed one of the two deliveries which I saw before graduation, and yet I received the obstetric prize.

It should also be remembered that it was not until the ideas of Semmelweiss, Holmes, Simpson and Tarnier concerning the infectious nature of puerperal fever had been accepted that devastating epidemics ceased to ravage lying-in hospitals; but they could not come to full fruition until after Pasteur had demonstrated the causative rôle of the streptococcus and until Stadfeld of Copenhagen had introduced the use of bichloride of mercury as an efficient antiseptic. So much was this the case that even as late as 1875 the International Congress of Physicians held at Brussels advocated the abolition of large lying-in hospitals and recommended the delivery of poor women in their own homes.

This recommendation found an earnest opponent in Garrigues, who in 1877 studied the mortality in 10,950 women who had been delivered during the course of years in six institutions in New York City and found that it averaged 2.3 per cent. Notwithstanding this mortality and the further fact that none of the institutions in question were utilized for the instruction of students, he held that lying-in institutions were not so excessively dangerous and concluded, provided the number of deliveries did not exceed one thousand per year and proper antiseptic precautions were observed, that they might be used for purposes of instruction without too great risk. Moreover, in his address at the opening of this hospital, Gaillard Thomas took pride in stating that the mortality from infection had been reduced to about 3 per cent. Doubtless, such results represented a great improvement over the past, as Dr. William M. Polk stated soon after he came to New York that a normal woman who was compelled to be delivered on the

"Island" ran a greater risk of death than had her father or brother in taking part in the bloodiest battle of the Civil War.

Furthermore, it should be remembered that until a few years before the opening of Sloane, cesarean section still remained a murderous operation and had not been performed successfully in a hospital in New York or Paris until after 1880. In this connection it may be of interest to state that Lusk thought it necessary to take 31 pages in describing the three successful cesarean sections which he reported to the American Gynecological Society in 1888.

Finally, in trying to give you an idea of the conditions then existing, I might mention that there were no large outdoor obstetric charities in New York City until 1890 when the Midwifery Dispensary in Broome Street was organized by Markoe, Lambert, Painter, Flint and Edgar, which, after its incorporation with the Society of the Lying-In Hospital of New York, became the nucleus of the great institution presently to arise on Second Avenue. Moreover, I do not think that I shall go far wrong when I attribute its inception, at least in part, to the influence of Sloane, in which you may recall Markoe served as the first resident.

In this condition of affairs, I can well appreciate what must have been the feelings of Dr. McLane when he announced to the authorities of the College of Physicians and Surgeons that he had been able to persuade Mr. and Mrs. William D. Sloane to offer with unprecedented generosity to build, equip and support a modern obstetric hospital adjoining the college, which was to be devoted to the care of poor women and to the instruction of students.

A thoroughly modern, three-story building, with accommodations for 28 patients and the necessary staff, was promptly erected at the corner of Fifty-ninth Street and Tenth Avenue, and was the forerunner of the building we know so well. It was dedicated on Dec. 29, 1887, and was opened for the reception of patients on Jan. 1, 1888. Drs. John C. Dalton, Francis Delafield and James W. McLane were the medical members of its first board of managers, and Dr. Gaillard Thomas, professor of gynecology and the former chief of McLane, made the principal address at the dedication.

As is well known Thomas was the great medical orator of his day and he did not belie his reputation on that occasion as is indicated by the following lines in which he expressed thanks to the donors: "I come to you the bearer of threefold thanks. In the name of science, for which you have shown so much solicitude; in the name of medicine for which you have so wholly pledged your appreciation; in the name of Humanity, which for cycle upon cycle will profit by your liberality, from the deepest depth of our hearts we thank you."

The gift was indeed a princely one, and remains so even today, when we have become accustomed to benefactions of great magnitude. In

one particular, however, Thomas was a poor prophet, for he said, "This house of refuge and of mercy, built with all the cunning of the architecture of our day, will stand for centuries"; and yet nine years later it was enlarged to accommodate 72 additional patients; and in 1911 a new wing was constructed to house gynecologic patients; and now, forty years after the dedication of the original building, the entire clinic has been moved to its present quarters miles away. Memory is a tricky function, and had I not refreshed my recollections, I should have stated that with the exception of the gynecologic wing the building which has just been vacated represented the original structure which had made a vivid impression upon me when I first visited it in 1890.

The opening of the Sloane Maternity in 1888 will always remain an important event in the history of medical education in this country, as for many years it represented the only institution worthy of the name which offered suitable facilities for the training of medical students and of young medical men in practical obstetrics. The College of Physicians and Surgeons should be proud of this distinction, and the people of New York are to be congratulated upon possessing for so long in their midst an institution which has supplied them with many competent obstetricians.

While the gynecologic wing was added in 1911, it was recognized that the function of the institution had altered, and, consequently, its name was appropriately changed from the Sloane Maternity to the Sloane Hospital for Women. Moreover, as in the meantime the college had been incorporated into Columbia University, it became in fact a University Woman's Clinic. Here again, a new trail was blazed, and the institution must forever enjoy the distinction of being the forerunner of the other woman's clinics which are now developing in various parts of the country and which are beginning to put it somewhat in the position which Germany enjoyed shortly after the end of the Franco-Prussian war.

The building was dedicated under happy auspices, and the presence of the president of the college, Dr. John C. Dalton and of Gaillard Thomas gave promise that it would do more than merely relieve suffering women and give sound training to medical students, but that it would also aim to extend the bounds of obstetric knowledge. Dalton, as you remember, was a distinguished physiologist, but what makes him particularly interesting to us is the fact that he was the first American to interest himself in the structure and function of the corpus luteum. In 1851 he wrote a 100 page prize essay on the subject, which was illustrated by excellent colored plates. In it he clearly demonstrated the difference in size, as well as in the persistence, of the corpus luteum following menstruation and pregnancy respectively—a fact which holds after the lapse of nearly eighty years. He later

took up the subject again in contributions made to the American Gynecological Society in 1876 and 1877, and so zealous was he in the prosecution of his researches that in the year elapsing between the last two papers, he was able to collect from autopsies in various parts of the country 38 sets of ovaries illustrating various phases in the life history of that important structure.

In those days T. Gaillard Thomas was a name to conjure with, and for the sake of the younger men I shall say a few words concerning him. Born in South Carolina, he received his medical degree in Charleston in 1852 and immediately thereafter obtained an internship at Bellevue. Following this he spent two years in Europe and on his return to New York became associated with Dr. J. L. Metcalf in general practice. He rapidly became prominent and within a few years succeeded Gunning S. Bedford as professor of obstetrics at the University Medical College. In 1863, he was appointed professor of obstetrics and of the diseases of women and children at the College of Physicians and Surgeons, with which he maintained his connection until his retirement at the age of seventy years. In 1879 the combined chair was divided, Thomas retaining gynecology, while McLane and Jacobi were assigned to obstetrics and pediatrics, respectively. This is not the place to consider his work critically, and it must suffice to say that his reputation was as great in Europe as in this country, and that on the occasion of his seventieth birthday he was tendered a banquet by his colleagues which surpassed any similar function which had been given in New York up to that time.

I do, however, wish to render him a personal tribute, as he made a great impression upon me when I first met him as a young man. I remember as if it were yesterday, calling upon him at his home without an introduction of any kind to ask him to do me a personal favor. I shall never forget his appearance and manner, a large man with a short white beard, an attractive voice and most delightful manners. He promptly granted my request, put his arm about my shoulders and accompanied me to the door with the assurance that it was his pleasure to serve me. His courtesy impressed me greatly, and in my dealings with young men I have tried to remember it, but I am afraid not always successfully.

Thomas was a great speaker and had deliberately trained himself in the arts of oratory, so that he sometimes made an impression beyond his merits. He dearly loved a discussion, and I have been told that on such occasions he sometimes allowed his oratory to overreach his discretion, and in this connection I like to recall the following story, for whose accuracy I cannot vouch. In discussing a paper at a medical meeting he overwhelmed his opponent by quoting figures from various authorities which were so contrary to the speaker's experience that he could make no reply. On returning home the speaker looked up the

references adduced and to his relief and surprise found that they completely substantiated his own conclusions. The next morning he called upon Thomas in great wrath to demand an apology but was surprised and disarmed when Thomas put his arm around him and said in his fine voice, "but, my dear sir, you would not hold against a man anything said in the heat of an argument."

Strange to say, only perfunctory obituary notices are to be found concerning James Woods McLane, who conceived the idea of the Sloane Maternity and was its head for the first ten years of its existence. I only remember meeting him once on my first visit to Sloane when I was courteously received by a pleasant and intelligent gentleman about fifty years old, who soon turned me over to his resident obstetrician, Tucker. After graduating from Yale and the College of Physicians and Surgeons, McLane showed such great promise that three years after receiving his medical degree he was appointed lecturer on *Materia Medica* at his alma mater and professor the next year. He soon became associated with Gaillard Thomas and in 1872 was appointed adjunct professor of obstetrics, diseases of women, and jurisprudence. When Thomas' chair was divided in 1878, McLane became professor of obstetrics and served until his resignation in 1898. At that time he did not entirely sever his connection with the school but continued to act as its dean until 1903 when he resigned as the result of a difference of opinion with President Butler. Following this he took great interest in the Roosevelt Hospital and served as a trustee and as president of its board until his death in 1912 at the age of seventy-three years.

From what I can gather, he was a man of great ability, a good doctor, an excellent lecturer, and a very efficient administrator. He engaged in general practice throughout his life, had a high social position and was regarded by many as a Brahmin. He was not a great contributor to medical literature and, as far as I can ascertain, wrote only a few papers of which the most important was a "Report of the First Series of 1000 Successive Confinements at the Sloane Maternity," to which reference will be made later. Probably his best known contribution was his insistence upon the advantages of the solid bladed forceps, which bears his name; but his most important service was the development of the Sloane Hospital and the training of a group of men who have perpetuated his teachings in New York. He apparently had little conception of the investigative function of a hospital, which, however, could scarcely be expected from one of his training and environment; but he was a strong man who had the courage of his convictions and did not hesitate to resign when he found himself unable to put them into effect.

During the ten years he was head of the clinic, he turned out four men who were a great credit to it, as well as to him: Markoe, Tucker,

Brodhead and Vorhees. Markoe was the first resident and after leaving the service took a prominent part in organizing the Midwifery Dispensary and afterward the Lying-In Hospital. I knew him well and am indebted to him for many courtesies. Like his former chief he was rather an administrator than a contributor to medical literature, but two of his papers will always persist. These are an article written in conjunction with Samuel W. Lambert in 1894 "Studies of Methods of Obstetrical Instruction," and "Observations and Statistics on 60,000 Labors," which appeared in 1909. In the first-mentioned article the methods of instruction in vogue in Europe were critically studied, and afterwards the desiderata were outlined for suitable instruction in this country. At that time the writers stated, "The true relation of obstetrics and gynecology is one of prevention and prophylaxis. Gynecology would be the minor branch today if the same pains were taken to instruct students as are given in the teaching of surgery, for example. Gynecology and obstetrics should be bound together; or rather, they should be one, but in this amalgamation obstetrics should take the lead and gynecology should be the secondary part." The second paper represents a storehouse of obstetric information and serves as a lasting tribute to the efficiency with which data were recorded at the hospital whose head he was.

My most vivid recollection of this period is in connection with Ervin Alden Tucker, who was resident obstetrician from 1890 to 1895. It was he who first showed me over the hospital, and he whom I looked up at each succeeding visit. He was a young man of great energy and of unusual clinical ability, and I imagine that it is at least in part due to him that the prompt success of the hospital was attributable. Like his predecessor he was not interested in abstract problems, but everything practical made a strong appeal to him. Consequently, most of his contributions were casuistic in character, so that the only one which will probably be remembered was "Birth of the Secundines"—an elaborate paper based upon the observation of 2,700 cases and clarified by 80 tables. His premature death at the age of forty was a great loss to practical obstetrics, and the affection in which he was held by his fellows was shown by the minute preserved in the transactions of the New York Obstetrical Society.

Brodhead and Vorhees are still alive and need no eulogy, but if anyone will take the trouble to go over their writings, as I have done, it will become apparent that each of them has been a consistent contributor and at one time or other has touched upon nearly every field of clinical obstetrics.

Following the resignation of McLane, the directorship of the Clinic devolved upon Edwin Bradford Cragin, whom most of you remember. He served from 1898 to 1918, being appointed professor of obstetrics

in 1899 and of gynecology in 1904. When the gynecologic wing was added to the hospital, as has been indicated above, its name was changed to the Sloane Hospital for Women, but for some reason Cragin conducted the two branches separately, so that many of his assistants completed their service with a training in only one of them.

There is no need for me to attempt to recall to you the energetic little man with his short beard and spectacles, who took his duties so seriously and who was so accomplished a gynecologist and obstetrician. I knew him well for years and was intimately associated with him in connection with several committees of the American Gynecological Society. I rather gained the impression that he had no interests outside his medical work, and I was delighted to learn from Ryder's sketch that he found a prolonged period of relaxation each year at his farm at Colchester, Connecticut. I am also under obligations to him for allowing several of my assistants to work under him and thus gain another point of view. Each of them returned to me enthusiastic concerning the advantages he had enjoyed.

Cragin was an excellent teacher and I understand that his students received great inspiration from him. He was a constant contributor to medical literature, but most of his papers were casuistic or general in character. He wrote two books: *Essentials in Gynecology*, which went through eight editions; and in 1916, in association with Ryder, an excellent *Textbook of Obstetrics*, which was a mirror of his experience and practice. One of his very important services was to insist upon the proper relationship between obstetrics and gynecology, as well as to resist repeated efforts to separate them in the school. The last article, which he wrote shortly before his death in 1918, was entitled "The Functions of a Woman's Hospital in a Large City," and the following lines from it clearly convey his conviction concerning the relation between the two subjects. "The man who is best fitted for obstetrics with its complications and injuries is the man with gynecologic training and experience. The man best fitted for gynecologic work is the man not only with surgical but with obstetric training and experience. The hospital best equipped for the conservation and reconstruction of women is a woman's hospital with a social service, an obstetric and a gynecologic department. A city with one or more such hospitals is rich. A city without one such hospital is poor."

Sloane is indebted to Cragin for maintaining its traditions as a great obstetric hospital and for adding to it an efficient gynecologic division, thus making it possible for his successors to transform it into a woman's clinic in the fullest acceptance of the word. In addition to giving fundamental instruction to hundreds of students, he trained a number of expert obstetricians. Cragin died just after the close of the World War, at the age of fifty-nine years, and in all probability should be regarded as having sacrificed himself to his zeal and restless activity.

This brings us to William E. Studdiford, a graduate of Princeton and of the Bellevue Medical School, who succeeded Cragin in 1919. He had been trained by Lusk and had been an attending physician to Sloane for five years before becoming its chief. He was not a great investigator nor a remarkable teacher of undergraduate students, nor was he a frequent contributor to the literature, and probably his best article was one submitted to the American Gynecological Society in 1909, on "The Involuntary Muscle Fibres of the Pelvic Floor." Yet his appointment was received with universal satisfaction, as it was generally felt that he was the right man for the post, and everyone believed that he was as honest and capable as he was physically large, and that he possessed the courage of his conviction. His friends felt that he knew what a real woman's clinic implied, and they trusted him to put his ideals into operation.

He at once set his big nature to the task, and his chief delight was to meet constantly with his associates and to imbue them with the idea that progress could be made only by seriously devoting themselves to adding to our store of medical knowledge. He promptly secured the cooperation of a number of men who were interested in borderline problems and made Dr. C. W. Johnson responsible for cooperation between the hospital and the department of pathology. This latter arrangement bore almost immediate fruit and was manifested by important investigations concerning birth injuries and the occurrence of pneumonia in stillborn and freshly dead infants.

His friends felt if his life was spared that he would soon make the Sloane a center of serious investigative activity; but unfortunately, just as this was developing, he died suddenly on Nov. 17, 1925, in his fifty-eighth year. All his friends regret his untimely loss, and no one more so than myself, as we felt that he was a true man, could be relied upon to be faithful to his ideals and to his friendships.

His tenure of office was too short to make possible the development of a school of obstetrics, but I am confident that large numbers of young men are the better for having been brought into contact with him and will carry through life the example of his rugged intellectual honesty.

Studdiford's mantle fell upon the shoulders of Benjamin P. Watson, who was trained in Edinburgh, and had professorial experience in Toronto and at his alma mater. He comes imbued with the traditions of Edinburgh, where each of his predecessors for 100 years has made the fullest use of relatively scant facilities to advance the bounds of obstetric and gynecologic knowledge. I predict the development of a school of obstetrics and gynecology such as Studdiford had in mind, the type of institution of which the old physiologist Dalton, who was present at the dedication of the original building would approve, that is a clinic devoted to the triple purpose of giving the best possible

treatment to its patients and enlightened training to students, and of advancing knowledge for its own sake.

When I read McLane's report upon the results obtained in the first one thousand deliveries at the Sloane Maternity up to Oct. 1, 1890, the query involuntarily suggested itself as to whether they are excelled by the clinical results obtained at the present time, and whether many of the vaunted advances of the past forty years are really as important as we are prone to suppose.

His results showed six maternal deaths in 1,000 deliveries at a time when the hospital was burdened by large numbers of emergency cases. The deaths were due to the following causes: 2 from placenta previa, and one each from rupture of the uterus, eclampsia, chronic nephritis before delivery, and septicemia. One of the patients with placenta previa and one with ruptured uterus were admitted in a moribund condition, while the patient who died from septicemia was profoundly infected at the time of admission. Accordingly, only three of the deaths could be attributed in any way to the clinic; namely, one from placenta previa, one from eclampsia, and one from chronic nephritis before the onset of labor. In other words, McLane's death rate was three per thousand, or three-tenths of 1 per cent and without a fatality from infection, a record of which any of us might be proud. Nothing was said in the report concerning the fetal mortality, which, in the absence of organized prenatal care, as well as of certain operations now in current use, must have been considerably higher than now.

In the series sixteen high forceps operations were reported, no cesarean sections, and three craniotomies upon children which had died prior to admission. Furthermore, it must be remembered that at that time rubber gloves or rectal examination had not been thought of, that the technic of abdominal palpation was probably rudimentary, and that vaginal examination was probably practiced in every patient with antiseptic precautions which would now be regarded as defective. The hands were disinfected by means of bichloride and alcohol; vaginal douches of bichloride solution, 1 to 5000, were routinely employed at the onset of labor and at the end of the second stage, while intrauterine douches followed every operative intervention. Yet there were no deaths due to infection. Since no mention was made of the puerperal morbidity, it is impossible to compare its incidence with that observed at the present time.

All must admit that McLane's results were remarkable and compare very favorably with those obtained in the succeeding 28,000 deliveries at Sloane. These were analyzed by Lyons in 1912 and showed an average gross mortality of 0.99 per cent. How can such results be explained? I am unable to give an answer, but to my mind they justify my query.

Who at the present time could conceive of conducting 1,000 deliveries without a considerable number of cesarean sections for contracted pelvis, without a laparotomy or so for labor obstructed by myomata or ovarian cysts, or in an emergency service for rupture of the uterus—not to speak of the cesareans which many do for eclampsia, placenta previa, or premature separation of the placenta? Furthermore, in the late eighties, it was not the practice to cut and reconstruct the perineum, nor were deep cervical incisions or vaginal hysterotomy frequently employed. Tamponade of the uterus for the control of hemorrhage had just been introduced, while blood transfusion was not thought of as a routine procedure; and yet McLane obtained as good maternal results as are being reported today or better.

Do such results mean that the women of forty years ago possessed a tougher fiber than at present? Or do they mean that in our current practice we are unwittingly sacrificing the mother for the sake of the child, or that some of us are possessed by an uncontrollable *furor operandi*, which takes little thought for the welfare of the mother? I am convinced that the latter is the case in many parts of the country, especially outside the conservatively managed teaching clinics, and I know that in some of the small hospitals with so-called open services many unnecessary operations are constantly being performed with an appalling sacrifice of maternal life. Furthermore, I have a suspicion that a considerable fraction of the excessive risk in childbirth, which characterizes this country, is due to unnecessary resort to cesarean section by those who do not realize its dangers and limitations.

In support of this belief I need only mention that one of my former assistants, who had also served a year at Sloane, informed me that last year in one of the hospitals in Houston, Texas, 102 cesarean sections had been performed. Fifty-two of them were done by various members of the staff with 18 deaths, as compared with 50 performed by himself and his partner with a single death, a mortality of 35 and 2 per cent, respectively. Without attempting to justify the indications in either group, it is apparent that in the former group at least 17 women had been sacrificed to ignorance.

I shall not attempt to labor the subject, but I do not hesitate to state that it is my experience in visiting clinics in various parts of the country that the frequency of operative interference is generally in inverse ratio to the interest which the chief of the service takes in the fundamental problems of obstetrics, and generally speaking the broader his scientific training the less is his interest in mere operating.

I hope you will not misunderstand me and consider that I am opposed to progress, as I hold that the greatest radicalism sometimes constitutes the truest conservatism. But at the same time I could not repress my impulse to lay stress upon the excellent results which were

obtained in this hospital in its earliest days and to draw from them conclusions which sound almost fantastic.

We should always remember that the fundamental dictum in all branches of medical practice should be *primum non nocere*, and that its precept and example are best set in a clinic whose chief is interested in other things than in merely accumulating and reporting large series of operations.

ENDOMETRIOMA

A CLINICAL AND PATHOLOGIC STUDY OF 159 CASES TREATED AT THE
CLINIC OF THE FREE HOSPITAL FOR WOMEN
BROOKLINE, MASSACHUSETTS

BY GEORGE VAN S. SMITH, M.D., BROOKLINE, MASS.

THE term endometrioma is applied to tissue which is microscopically similar to endometrium, but which is found elsewhere than on the surface of the uterine cavity. It is synonymous with chocolate cyst, endometrial implant, endometrial adenoma, endometrial hematoma, ovarian hematoma, hemorrhagic perforating cyst, Sampson's cyst, menstruating cyst and adenoma ovarii endometrioides. The term is being extended to include pedunculated cystic and solid intrauterine adenomyomas, diffuse and discrete adenomyomas of the uterine wall, adenomyomas of the uterine cornua, and the nodes of salpingitis isthmica nodosa, which many regard as inflammatory swellings of adenomyomas of the uterine cornua. Strictly speaking, endometrial polyps are endometriomas. Since the origin of all these foci, nodes, cysts, and tumors, microscopically similar to endometrium, is not completely explained by either the transplantation theory of Sampson, the embryonic rest theory of von Recklinghausen, or the serosa (peritoneal reversion or metaplasia) theory of Meyer, the terms endometrioma and endometriosis are descriptive rather than genetic. The purpose of their use is to embrace in one group a number of closely related, though heretofore loosely correlated pathologic lesions of the female pelvis and peritoneum.

Although all heterotopic endometrial-like tissue formations are not true tumors, it seems best to classify them as such since they may at any time become neoplastic in the form of benign, cystic, or solid tumors that may even infiltrate surrounding tissues. Their presence stimulates growth and hyperplasia of surrounding fibrous and muscular tissue, in some locations resulting in diffuse or discrete, though not encapsulated, adenomyomas and in other places causing the formation of fibrous adhesions. That certain of the benign papillary serous cystadenomas of the ovary develop directly from endometrial cysts has been indicated by Sampson and of this convincing microscopic evidence

has been found at this clinic. Furthermore, since Sampson associated endometriosis with certain malignant ovarian cysts, the more frequent finding of endometrioma in one or both ovaries in cases of malignant ovarian cyst suggests that chocolate cysts, with their retained, chemically changed secretions may play an etiologic rôle in cancer production. The finding of endometrial carcinoma in a uterine polyp or associated with one adds weight to the evidence that occasionally endometriomas are precursors of carcinoma.

The pathologic material which forms the basis of this paper comprises 159 cases of endometriosis, 34 of which are from the private practice of Drs. William P. Graves and Frank A. Pemberton. It also includes the pathologic study of 41 additional private cases, the clinical records of which are not available. Since 77 per cent of the cases herein reviewed have been diagnosed since January, 1920, it is probable that many endometriomas were overlooked prior to that date. Cases of adenomyoma of the uterine cornua and salpingitis isthmica nodosa have not been included in this report because of the lack of agreement as to their origin and character and also for the reason that many have been missed, since the cornua of all uteri removed at operation have not been examined as a routine at this clinic.

AGE

The youngest patient of this series was twenty-three, the eldest seventy-two, the other patients being evenly distributed between the ages of thirty and fifty.

MARITAL CONDITION

Of the 159 patients, 66, 41.5 per cent, had never been pregnant; of these, 40 were unmarried. Seven patients had been pregnant, but aborted. The sterility percentage for this group was 20.6. The average number of children per married patient was 1.7.

FAMILY AND PAST HISTORY

A family history of tuberculosis was given by 11.9 per cent of the patients; of malignant disease by 8.8 per cent. Fifty-seven patients had had previous operation: dilatation and curettage, 31; appendectomy, 15; plastic operations on vagina, 12; suspension of the uterus, 10; excision of ovary, 8; tubal pregnancy, 1; and gall-bladder operation, 5.

COMPLAINTS

The complaints and the number of patients giving each complaint are as follows:

Flowing	52
Painful menstruation	44
Backache	40
Pain in lower abdomen	31
Swelling of abdomen	17

Pain in right side	16
Attacks of pain in right side	12
Pain in left side	12
Attacks of pain in left side	2
Nausea and vomiting during menstruation	10
Falling of womb	8
Bearing down and pressure in pelvis	6
Mumps followed by painful, excessive and irregular menstruation and backache	1
Painful defecation	2
Obstruction in rectum	1
Pressure in rectum especially during menstruation, and bleeding from rectum	1
Swelling in left groin, larger and painful during menstruation and tender for a week afterward	1

The duration of symptoms varied greatly, ranging from one week to twenty years.

MENSTRUATION

Menstruation negative	35
Acquired dysmenorrhea	36
Metrorrhagia and acquired dysmenorrhea	15
Menorrhagia and acquired dysmenorrhea	10
Menorrhagia, metrorrhagia and acquired dysmenorrhea	11
Dysmenorrhea since puberty	10
Metrorrhagia	17
Menorrhagia and metrorrhagia	8
Menstrual molimina but no flow	1
Menorrhagia	14

Five patients had passed the menopause.

The next table indicates the preoperative examination findings. The preoperative diagnosis was most often pelvic inflammation, fibroids, ovarian cyst, prolapse or carcinoma, in the order named, and in about twenty cases endometriosis was mentioned as a possibility. In a few

DIAGNOSIS BASED ON ADMISSION EXAMINATION

Adherent retroversion	38
Fibroid uterus	34
Fundus pushed forward by masses	31
Prolapse and retroversion	17
Second degree retroversion	13
Uterus in position	8
Tumor of ovary	5
Retroversion, flexion	5
Procidentia	1
Complete stenosis of cervix, uterus cystic	1
Small, hard tumor of left groin	1
Fungating growth of posterior vaginal wall and stenosis of rectum	1
Dense infiltration between vagina and rectum	1
Carcinoma of breast	1
Carcinoma of cervix	1

instances the finding of a normal temperature, white cell count, and sedimentation time made endometriosis more probable in spite of the tenderness, moderate immobility and the palpation of masses behind the uterus, all of which are characteristic of pelvic inflammation. The diagnosis of possible endometriosis has been made only since 1920 when renewed interest in these growths stimulated an effort to estab-

lish a symptom complex characteristic of this disease. Undoubtedly the diagnosis can be made with assurance preoperatively in an occasional case examples of which will be given below. In three cases, treated before 1900, the diagnosis of endometrial tumor was not made, but a recent study of the clinical and operation records left little doubt as to the character of the lesions. In all other cases the diagnosis was made or confirmed soon after operation by microscopic examination of the tissues removed.

OPERATION AND RESULT

Resection of the right ovary was performed on three patients. One felt well, but had metrorrhagia eleven months after operation. The third, being only slightly relieved, was operated upon one year and six months later, but the findings did not justify hysterectomy. The adhesions were broken and the uterus suspended. The patient was well three months after the second operation.

Resection of the left ovary was performed on two patients. One was well three months later; the other complained of pain in the left side one year and five months after operation.

Resection of both ovaries was performed in two cases. One patient cannot be traced. The other remained well for one year and then complained of pain in the left side. At a second operation adhesions were broken and a supravaginal hysterectomy was performed. She was well one year after the hysterectomy and two and a half years after resection.

Excision of one ovary and resection of the other were performed on one patient. Four years later she stated in a letter that she was well but admitted some catamenial irregularity and occasional severe pelvic pain.

Unilateral oophorectomy was done in 17 cases. Six of the patients are untraceable. The results, briefly tabulated, in the others are: Well six months after operation, 1. Well two years after operation, 1. Well three years, two months after operation, 1. Well thirty-two years after operation, 1. Moderate dysmenorrhea one year, ten months after operation, 1. Well except for menorrhagia, two years, four months after operation, 1. Cesarean delivery one year, ten months after operation; well four years, six months later, 1. Well, but with metrorrhagia, six years after operation, 1. Pain in the lower abdomen six years, two months after operation, 1. Well for three months, then pain in the lower abdomen; supravaginal hysterectomy two years, five months after operation; well seven months later, 1.

Bilateral oophorectomy was performed on two patients before 1900. One is untraceable. The other is well, thirty-one years later.

Myomectomy alone, for discrete subserous or intramural adenomyoma (endometrioma) was done in 13 cases. Four of the patients are untraceable. One, pregnant six months after operation, is now untraceable.

Two were well less than one year after operation, two were well one to two years, and three were well two to three years after operation. One patient complained of pain in the right side and rectum three years, ten months after operation.

Excision of broad ligament endometrioma, one case. Although the patient was symptomatically well one year, nine months after operation, a mass could be felt in the pelvis.

Excision of endometrioma of left round ligament in inguinal canal, one case. The patient was well twelve years, eight months after operation. The preoperative diagnosis, made in 1915, was inguinal hernia despite the clear relation to menstruation.

Supravaginal hysterectomy, colostomy and dilatation of rectum for rectovaginal endometriosis, 1 case. The patient is well four years after operation. The admission diagnosis had been carcinoma of the rectum, although rectovaginal endometriosis was considered.

Supravaginal hysterectomy, 104 cases. Untraceable, 17. Operative death, 1 (surgical shock two days after operation, 1895). Died three months after operation, cause unknown, 1. Duodenal ulcer ten months after operation, 1. Died of "natural causes" two years, five months after operation, 1. Died of carcinoma of the vagina nineteen years after operation, 1. Multiple sclerosis five years after operation, 1. Living with recurrent carcinoma of the ovary one year, six months after operation, 1. Well less than one year after operation, 28. Well one to two years after operation, 10. Well two to three years after operation, 10. Well three to four years after operation, 10. Well four to five years after operation, 5. Well five to ten years after operation, 8. Well ten to twenty years after operation, 7. Well twenty to twenty-two years after operation, 2.

Four of these patients had had radium, from one week to three years before operation, without relief.

Complete hysterectomy alone was performed on nine patients. One is untraceable. She had carcinoma of one ovary, endometrioma of the other. One died of recurrent carcinoma of the cervix four years and four months after radical operation (diffuse uterine wall endometriosis was an incidental finding) having had radium and an operation for closure of a vesicovaginal fistula. One died seven years, seven months after operation, of recurrent carcinoma of the ovary (the endometrioma was subserous in the posterior wall of the uterus). Six were well two years after operation [(1) carcinoma of endometrium, diffuse endometrium of uterine wall, and bilateral ovarian endometrioma; (2) diffuse endometrioma of uterine wall, endometrioma of tube and ovary and fibroid with sarcomatous degeneration; (3) discrete endometrioma of the posterior wall of fundus with sarcoma; (4) carcinoma of endometrium and peritubal endometrioma; (5) diffuse endometriosis of

uterine wall and chronic pelvic inflammation; and (6) hematometra with endometrioma of the ovary].

Excision of endometrioma of cervix and radium, 2 cases. One patient (who had had 100 mg. of radium in the uterus for six hours) was well one year, nine months later. The other (100 mg. for twelve hours) was well three years, eleven months after operation.

Myomectomy, then radium (100 mg. for twelve hours), 1 case. The patient was well three years later.

Complete hysterectomy for carcinoma of the endometrium (endometrioma of ovary also), 1 case. The patient received radium treatment, 225 mg. for fourteen hours, for recurrence four years, nine months later, and was well six years, six months after the recurrence was treated.

LOCATION AND SIZE OF ENDOMETRIOMAS

The clinical data recorded above have dealt with 159 cases. The pathologic findings outlined below cover 200 cases. Endometriomas or endometriosis were found in the following locations:

Diffuse in wall of uterus, 45. Discrete, subserous, in posterior wall and fundus of uterus, 27. Discrete in the uterine wall, intramural, 11. Diffuse and discrete in uterine wall (in one case showing a decidua reaction), 4. Discrete in uterine wall with sarcomatous dedifferentiation, 1. Both ovaries, 34. Right ovary, 29. Left ovary, 28. On fundus and posterior wall of uterus, 15. In tubal serosa, 5. Rectovaginal septum, 3. Cervix, 2. Broad ligament, 2. Pedunculated in uterine cavity, 2. Endometrioma and papillary cystadenoma of same ovary, 3. Free in peritoneum, 1. In parametrium, 1. On left parovarian cyst, 1. On bladder serosa, 2. Left round ligament in inguinal canal, 1. Left round ligament near its insertion, 1. On omentum, 1. Sigmoid, 1. Small intestine, 1. Appendix, 1.

The discrete endometriomas of the uterus varied in size from 2 mm. to 3 cm. and were usually $\frac{1}{2}$ to 1 cm. in the greatest diameter. The ovarian endometriomas varied from microscopic dimensions to 18 cm. Twenty-nine per cent were from 5 to 10 cm. (inclusive); 53 per cent were from $\frac{1}{2}$ to 4 cm. (inclusive) in diameter.

ASSOCIATED PATHOLOGY

Pelvic adhesions, 119. Fibroid or fibroids, 82. Chronic salpingitis (microscopic diagnosis), 75. Gland hypertrophy of the endometrium, 66. Endometrial polyp, 15. Cervical polyp, 5. Adenocarcinoma of the endometrium, 4. Carcinoma of the other ovary, 4. Papillary serous cystadenoma of the other ovary, 3. Papillary serous cystadenoma of same ovary, 3. Bilateral papillary parovarian cysts, 1. Sarcoma of the ovary, 1. Fibroma of the ovary, 1. Malignant papillary pseudomucinous cystadenoma of the left ovary (and diffuse uterine endometriosis), 1. Benign pseudomucinous cystadenoma of the ovary, 3. Tubal

pregnancy on same side as endometrioma of ovary, 1. Double uterus, 1. Hematometra (complete cervical stenosis), 1. Sarcomatous degeneration of a fibroid, 1. Leiomyosarcoma of uterine wall, 1. Adenocarcinoma of the cervix, 1. Kraurosis vulvae, 1. Carcinoma of breast, 1.

CASE SUMMARIES

The following summaries are given as examples both of typical and unusual cases of endometriosis.

Typical Cases.—1. Mrs. R. S. Aged fifty-one. Married thirty-one years. Children, 13; abortions, 4. Complaint: Painful and profuse menstruation for one year. Catamenia negative previously. Supravaginal hysterectomy was performed for a large uterus which was found to contain a diffuse endometriosis. Four years, nine months later a complete vulvectomy was performed for kraurosis. She died of cerebral hemorrhage one year, five months after the second operation.

2. Miss E. M. O'N. Aged thirty-nine. Complaint: Lump in lower abdomen for one month. No pain or abnormal menstruation. At operation a multiple fibroid uterus was found, pushed forward by bilateral 8 cm. cysts. There were many dense adhesions. A supravaginal hysterectomy was performed. The pathologic examination showed multiple fibroids, chronic salpingitis, diffuse endometriosis of the uterine wall, and bilateral ovarian endometriomas. Ten years, four months after operation the patient was well, her occupation being that of a policewoman.

3. Mrs. W. A. McC. Aged twenty-four. Married six months. Complaint: Painful micturition and menstruation. Preoperative examination: Uterus in second degree retroversion, with a mass behind it, apparently adherent. At operation an adherent endometrioma of the right ovary, 6 cm. in diameter, was found and removed. A small endometrioma was excised from the serosa of the posterior wall of the uterus. The appendix, whose tip had been adherent to the right broad ligament, also showed endometrioma microscopically in its serosa. The patient was pregnant when seen sixteen months after operation and was delivered by cesarean section six months later. Both the patient and child were well four years, six months after delivery.

4. Miss A. S. Aged thirty. Complaint: Pain in right side and painful, profuse menstruation, progressively worse for two years. Examination: Tender, retroverted, adherent uterus, and a mass on the right side of pelvis. At operation a chocolate cyst of the right ovary, 4 cm. in diameter, was removed. The patient was well six years later.

5. Miss S. M. D. Aged thirty-four. Appendectomy at eighteen. Complaints: Profuse periods every twenty-one days for two years. For four months pain in lower abdomen, worse on right, and worse with periods. Examination: Uterus pushed forward by a cyst of the right ovary. Hysterectomy was performed. The patient was well four years later.

Unusual Cases.—1. Mrs. A. E. J. Aged thirty-eight. Married fifteen years. One child; no abortions. Complaint: Pain in left side during menstruation for two years; swelling in left groin for two years, large and painful during menstruation. At operation a 2 cm. tumor, which was found to be connected with the sac of a left inguinal hernia, was excised. It was an endometrioma. Twelve years, eight months after operation the patient wrote that she was well. She had had a breast amputated and x-ray treatment for fibroids at another hospital within the previous four years.

2. Miss M. M. Aged forty. Complaint: Pressure in the rectum, worse after menstruation, for four years; also bloody discharge from the rectum. Examination: Large abdominal tumor, fungating growth of posterior vaginal wall, almost com-

plete closure of the rectum; probably carcinoma. Under ether a smooth non-ulcerated, annular stricture of the rectum was found and dilated. There was much rectovaginal induration, and the posteriovaginal fornix was ulcerated. Radium, 225 mg., was applied, but was removed in five hours when endometriosis was diagnosed. The following week intestinal obstruction made operation imperative. Enormous dilatation and hypertrophy of the colon were found. A fibroid uterus both tubes and ovaries were densely adherent. There was a cystic endometrioma of the left ovary. A supravaginal hysterectomy and colostomy were performed. A specimen from the posterior culdesac showed endometriosis. Within two months the patient improved greatly, and in three months the colostomy was closed. At the present time, four years after operation, the patient is well. Although there are a few indurated areas in the pelvis, the lumen of the rectum is competent.

3. Mrs. E. E. Aged thirty-eight. Married twelve years. One child, stillborn. Complaint: Slight show of blood between catamenia for two to three years; also slight obstruction of the lower bowel. At operation the posterior vaginal fornix was found to be ulcerated and there was dense infiltration in the rectovaginal septum. Pelvic adhesions were broken and a supravaginal hysterectomy was performed. The pathologic findings were: Gland hypertrophy of the endometrium, fibromyoma, chronic salpingitis, endometrioma of the left ovary and endometriosis of the rectovaginal septum. The patient was well one year, three months after operation.

4. Mrs. L. M. Aged thirty-five. Married and divorced. Children, two. The last abortion had been induced at two months, fifteen years before admission. Complaint: No flow at the time of menstruation for fifteen years, although the molimina of menstruation and cramps were present; also pain in the left side, worse at the time of menstruation. Examination: Complete stenosis of the cervix; uterus cystic; cystic mass on the left side. At operation the uterus was found to be a cyst 8 cm. in diameter, with a wall only one-half cm. thick. The left tube and ovary formed a cystic mass 10 cm. in its greatest diameter. There were dense adhesions. Complete hysterectomy was performed. Pathologic findings: Gland hypertrophy of the endometrium, chronic salpingitis and ovaritis, hematometra and endometrioma of the left ovary. The patient was well one year, three months after operation.

SUMMARY AND CONCLUSIONS

1. The introduction of the paper consists of a brief discussion of terms, theories and pathology in relation to ectopic and endometrium-like tissue. An effort has been made to include many closely related conditions under the terms endometrioma and endometriosis.

2. A clinical and pathologic study has been made of 159 cases. The pathologic data of 41 other cases have been included.

3. Most cases when treated were between the ages of thirty and fifty.

4. Twenty-five per cent of the patients in this series were single. Of the married patients 20.6 per cent were sterile. The average number of children for each married patient was 1.7.

5. Abnormal uterine flowing, acquired painful menstruation, back-ache, and lower abdominal pain were the most frequent complaints.

6. There was some menstrual abnormality in 77.3 per cent of the cases. Acquired dysmenorrhea, either alone or with menorrhagia or metrorrhagia, or both, was present in 60.5 per cent of these.

7. A pelvic tumor was palpable on admission in 44.6 per cent of the cases. Of the remaining cases 41 had a retroverted and adherent uterus.

8. Of those patients submitted to conservative operation 32.5 per cent were not cured, although relief was obtained. A second operation was necessary in 9.3 per cent. Primary radical operation resulted in permanent cure in every case where only benign conditions were present. Since the percentage of sterility for these patients is high and since only two of this series are known to have become pregnant after operation, the radical procedure is to be chosen in cases where an absolute cure is necessary, as in working women. In a patient who in other respects is a potential child bearer and is willing to risk a second operation primary conservation operation should be performed.

9. Pelvic adhesions, generally dense, were present in 60 per cent of the cases. Fibroids were associated in 41.6 per cent of the cases; malignant disease in 7.1 per cent.

10. A 7.1 per cent of associated malignancy, almost entirely pelvic, in a series of cases of this sort suggests that endometriosis may possibly play more than an incidental rôle. Although as yet no patient has been known to develop malignant pelvic disease following a conservative operation for endometriosis, it must be remembered that the conservative operations were done on younger patients and that continued follow-up may disclose a high incidence of malignancy.

The writer wishes to thank Drs. William P. Graves and Frank A. Pemberton for the privilege of reporting their private cases and for their interest and assistance in preparing this paper.

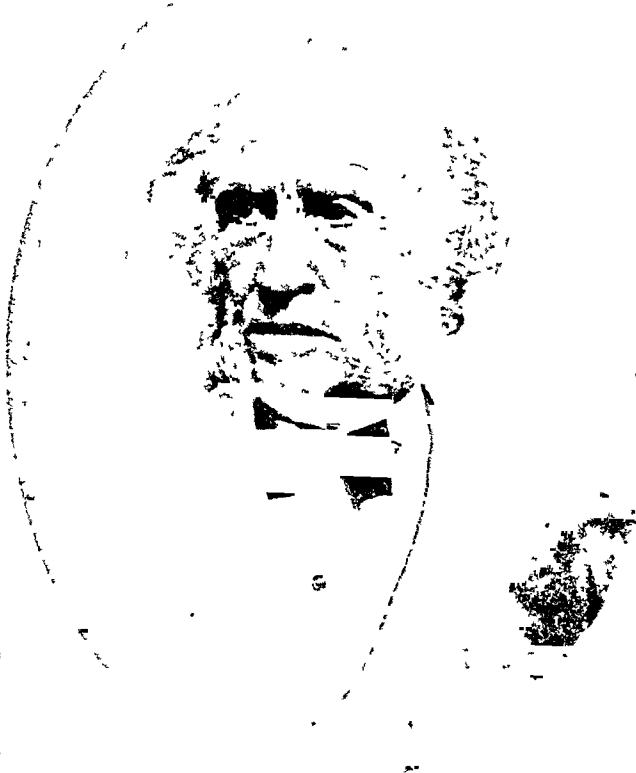
MARMADUKE B. WRIGHT AND CEPHALIC VERSION

BY HERBERT THOMS, M.D., NEW HAVEN, CONN.

"WE STAND on the shoulders of our forefathers," wrote John Bright, "and see further." The forefathers of American obstetricians interest us not alone because of the important developments in our science that have been derived from them but also because acquaintance with their lives and their works is of real inspiration.

The list of American contributions to obstetrics and gynecology is no mean one and with this list of achievements, among the names associated that of Marmaduke Burr Wright stands unquestioned. The description of cephalic version which he gave to the world in 1854 remains a classic in obstetric literature, and if you, reader, should be so fortunate as to some day discover a small paper covered pamphlet entitled "Difficult Labors and Their Treatment" by M. B. Wright of Cincinnati, you had better cherish it. You have what collectors designate as a "find," and the charm in handling its somewhat yellowed pages will be further enhanced by what you will find written thereon.

A brief story of its author begins at Pemberton, New Jersey, where on the tenth of November, 1803, Marmaduke B. Wright was born. In the High School at Lawrenceville and in Trenton Academy under Elijah Slack he prepared for his apprenticeship in medicine, which began when he was sixteen. It was then that he began to study with Dr. John McKelway, an Edinburgh graduate and a practitioner in Trenton.



*Very Truly
M B Wright*

Following this instruction, he attended three courses at the University of Pennsylvania, where he was graduated when he was twenty years of age. At this time his father, who was considered wealthy, by an unfortunate business adventure lost his property and removed to Columbus, Ohio. This attempt to recoup in the New West failed, and a year afterward the father died, leaving a widow and seven children. The early professional success that attended young Doctor Wright may be ascribed in part to the necessary efforts to keep this family together. In 1833 not only was he a leading practitioner in his district, but he was

elected a member of the Ohio Legislature, and although the youngest member, was recognized as the Whig leader of that body. His career as a legislator is remembered particularly because of his successful efforts in bettering the treatment of the insane in his state. In 1838 Dr. Wright was elected to the Chair of Materia Medica and Therapeutics in the Ohio Medical College. He then removed to Cincinnati, where he remained until his death. In a short time he succeeded to the Professorship of Obstetrics and Diseases of Women, and twenty-eight years later he was made Emeritus Professor of the same chair. Dr. Wright was a frequent contributor to the medical literature of his day, and such subjects as Scurvy, Drunkenness and Insanity, Drunkenness Its Nature and Cure, The Physiologic and Therapeutic Uses of Water, issued from his pen. His interest in teaching is manifested by such articles as The Incidents of Professional Life, The Experimentation and Dissection of Human Bodies, The Science of Medicine as a Compilation of Truths, and The Qualifications of Professors and Students.

To know a man is to gain knowledge of his ideals. Nowhere are the ideals of this man better set forth than in the recommendation which he as a committee member presented to the State Medical Society in connection with the revision of the Code of Ethics of that body. "Resolved," reads this communication, "that the Ohio State Medical Society does not require the existence of any code of ethics, as such, to secure kindness of intercourse, concert of action, and scientific improvement among its members; that the great moral code containing the injunction 'Do unto others as ye would they should do unto you' and our feelings and knowledge as gentlemen, are as efficient as anything can be in promoting a true and unexceptional spirit of social and professional intercourse." However, the Medical Society of the State of Ohio was no more ready for this interpretation of Ethics than are similar bodies today, and it was forthwith rejected.

The personality of M. B. Wright is further seen in his writings. In the medical contributions of a generation ago we seem to see more of the writers than we do today. So often in their sentences do we feel their gentlemanly presence. It is something other than mere grandiosity when William Smellie writes hoping to be screened "from the imputation of arrogance with regard to the task I have undertaken; and I flatter myself that the performance will not be unserviceable to mankind." Affectation does not ring as clear as this. So it is with Wright in the introduction to his essay. "Encouragement is given," he says, "in the outset of our present undertaking, by the reflection, that truth contains as much intrinsic value expressed by those trudging the humbler walks of the profession, as when inculcated by the professor in his chair or transferred from page to page throughout a long line of standard publications," and again, it is "an attempt to correct

errors, to lessen the perplexities of the accoucheur, to mitigate suffering and to save life.”

In the day in which this was written we must not forget that a physician was considered by his community as a fine gentleman in all that this appellation implied, and that he in return endeavored by his manner, his dress, and his correspondence to merit that reputation. When physicians laid aside the frock coat, something more than mere ostentation of dress went with it.

One of Wright’s contemporaries wrote of him, “The one of nature’s books he knew thoroughly was practical obstetrics.” So from his great experience Wright tells us, “A man may justly congratulate himself that he has never been intrusted with the management of a difficult case of labor, but he should not cherish the belief on this account, that his next case will not require special interference.” In this manner Wright begins his argument for the adoption of his method of cephalic version and then proceeds, “It has been claimed that nature is adequate to the accomplishment of her own wise designs, and that shoulder presentations may be left with safety to the spontaneous action of the uterus (spontaneous evolution) . . . Still the question is not, whether spontaneous delivery is accomplished in these cases by ‘evolution’ or ‘expulsion’ but whether the physician should stand idle, and hope for delivery by the long-continued agonies of his patient . . . Not only does a labor of this description require unparalleled voluntary efforts, not only does it involve extreme suffering of body and mind, but many patients have died before or soon after delivery; and alas, too many of those who may have survived, have found themselves entailed with incalculable injury, or enfeebled general health.” Thus does Wright indict the policy of waiting for spontaneous evolution to deliver shoulder presentation.

To the great consternation of this observer, neither Meigs nor Dewees, both obstetric leaders in their day, gave attention to this abnormal presentation, in fact, the former wrote, “It may be that those old practitioners in the days of Queen Elizabeth may have sometime succeeded in pushing up a presenting shoulder, in getting the head at last to come into the strait again, but such an event appears to me in any case, most improbable.” “While we admit,” says Wright in reply, “with both the distinguished teachers that ‘meddlesome midwifery is bad’ we greatly fear that tardy action has been followed by a large amount of evil.” After the repetition of cases successfully treated by cephalic version, the author of the essay justifies his position as follows:

1. That at an early period in labor, and especially if called before the uterus has been deprived of its liquid contents, a shoulder may be converted into a vertex presentation more easily than turning by the feet is ordinarily performed.

2. That although the membranes may have been long ruptured, turning by the head can be accomplished with great facility.

3. That delivery by cephalic version may be speedily effected after repeated and ineffectual efforts have been made to turn by the feet.

4. That cephalic version should receive a prominent, nay leading place as a means of expediting delivery in shoulder presentations.

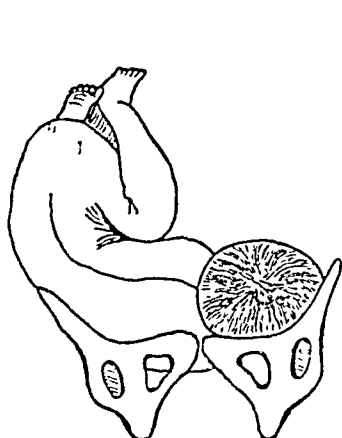


Fig. 9.

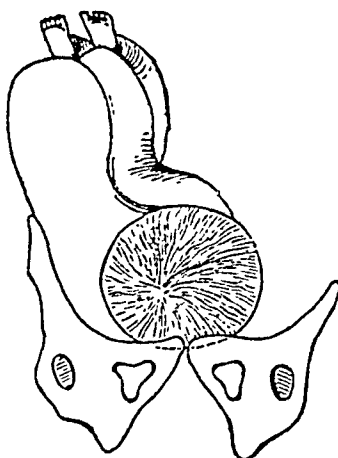


Fig. 10.

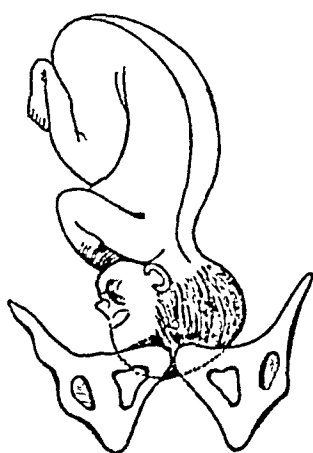


Fig. 11.

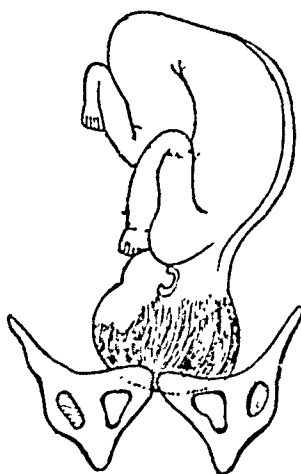


Fig. 12.

Description of Plate From Text of Essay

"By an examination of Plate 3, Figs. 9, 10, 11, and 12, the different changes which take place in the position of the fetus during cephalic version, from the return of the arm above the brim of the pelvis to the first presentation of the vertex will be observed."

The description of the Wright method given in the essay is as follows: "Suppose the patient to have been placed upon her back, across the bed with her hips near its edge, the presentation will be the right shoulder, with the head in the left iliac fossa, and the arm if prolapsed having been placed, as near as may be, in its original position across the breast. We now apply our finger upon the top of the shoulder and

our thumb in the opposite axilla, or on such a part as will give us command of the chest and enable us to apply a degree of lateral force. Our left hand is also applied to the abdomen of the patient over the breech of the fetus. Lateral pressure is made upon the shoulder in such a way as to give the body of the fetus a curvilinear movement. At the same time the left hand applied as above makes pressure so as to dislodge the breech as it were and move it toward the center of the uterine cavity . . . Without any direct action upon the head it gradually approaches the superior strait, falls into the opening and will in all probability adjust itself as a favorable vertex presentation."

In discussing Wright and cephalic version it is proper that we should mention the contribution to this subject by Dr. Braxton Hicks of London. Hicks's method, which differs somewhat from that of Wright, was first given to the profession in 1860 and more fully in 1864. Hicks had no knowledge of the work of his predecessor, which fact he acknowledged in a later communication. The differences in the two methods are briefly these: in the Wright method there is no direct action on the head as in the Hicks maneuver, and further, the application of the hand upon the mother's abdomen over the child's breech is perhaps the most essential feature. In the Hicks method, however, such application of the external hand is not emphasized.

The closing words of the Essay on Cephalic Version are characteristic of the writer. "Possibly our time might have been more profitably employed than in writing these pages. If, however, we shall have directed the minds of our brethren into a new train of observations, and aided in giving a true value to cephalic version, and, especially if life shall thereby be preserved, we shall consider that an ample reward has been bestowed on our labor."

In remembering the writer of the foregoing sentences, let us think not only of his noteworthy contribution to obstetrics but also of his most useful life, nearly fifty years of which were spent in practice. We should remember particularly his pioneer work in medical education in the then New West, and the beneficent influence which his personality had in the lives of his confreres. His description by a contemporary is, I think, a sincere picture. "Striking, erect, firm, with an intellectual face, a penetrating eye, he had the bearing of a resolute, brave man, the refinement and courtesy of a gentleman."

Dr. Wright died in Cincinnati, August 15, 1879. A fitting epitaph is found in his own words, "Independence rather than place, be a martyr for truth, rather than be false to your profession to appease local jealousy. And we would urge that while the practitioner awards honor where it is due he should be true to himself, by thinking and acting for himself." Marmaduke B. Wright was the embodiment of this doctrine.

REFERENCES

- (1) *Parvin, T.*: Tr. Am. Gynec. Soc., 1879. (2) *Parvin, T.*: Am. Pract. 20: 186-188, 1879. (3) *Hicks, B.*: Lancet. July 14, 1860. (4) *Hicks, B.*: Trans. Lond. Obst. Soc. 5. 1864. (5) *Starling, L.*: Tr. A. M. A. 31. 1880. (6) *Wright, M. B.*: Proc. Ohio State Med. Soc., 1854. (7) *Wright, M. B.*: Am. Pract., March, 1876. (8) Trans. Ohio State Med. Soc., p. 112-115, 1880.

NEW HAVEN HOSPITAL.

REPORT OF A CASE OF LEIOMYOBLASTOMA AND PAPILLARY CYSTOMA OF THE OVARY

BY IRVING F. STEIN, M.D., AND BENSON BLOOM, M.D., CHICAGO, ILL.

(From the Department of Gynecology and the Snyder Fund of the Michael Reese Hospital and the Nelson Morris Institute for Medical Research)

THIS case is one of a smooth muscle sarcoma arising in conjunction with a huge benign papillary cystoma of the ovary in a sixty-five year old woman. At the time of operation, it was thought that we were dealing with a malignant papillary cystoma with metastases already present, in spite of the smoothness of the outer surface of the cyst, which is usually considered as being helpful in determining the benign character of such a cyst. The malignant tissue was everywhere sarcomatous, and the epithelial portion of the cyst in none of a number of sections was even suggestively malignant. We were unable accurately to determine the site of origin of the sarcoma, but we believe that it arose in some portion of the papillary cystoma, especially since necropsy revealed no more obvious source. Of the smooth muscle tissues in the ovary, the ovarian blood vessels are the most common site from which such a sarcoma might arise; but its origin from smooth muscle in the ovarian stroma, from the smooth muscle sometimes found surrounding embryonic misplacement cysts, of which the associated papillary cystoma is an example, or from a preexistent myofibroma or dermoid, no evidences of which were found, must be considered. Because of the absence of any gross or microscopic abnormalities of the fallopian tube, except an adhesive salpingo-oophoritis, it is not at all likely that this sarcoma arose from the smooth muscle of the tube. It may be pointed out that the wall of the cyst was completely hyalinized except for islands of tumor tissue and the epithelial lining, and the suggestion may be pertinent that irritation from enlargement or necrosis of the cyst was a factor in producing a malignant change in the smooth muscle tissue.

Although it is common knowledge that papillary cystomas of the ovary not infrequently become carcinomatous, we can find no references in the literature to a change such as we believe to have occurred in this case; that is, of a smooth muscle sarcoma developing in a benign papillary cystoma of the ovary.

CLINICAL HISTORY

The patient, aged sixty-five, entered the hospital on May 10, 1927, complaining of weakness, loss of weight, epigastric fullness, and the gradual development of a nodule in the abdomen, all having become manifest for five months previous to admission. The past medical history was negative except for smallpox in early childhood. The menstrual history was normal in all respects, the menopause having occurred at the age of forty-five. The obstetric history revealed two normal, full-term pregnancies, preceded by a spontaneous abortion. About a year previous to admission the patient stated that the abdomen enlarged considerably and that this enlargement was associated with marked frequency of urination and polyuria; but the enlargement quickly subsided, to recur in October, 1926, from which time it slowly progressed.

Physical examination on admission revealed an elderly female presenting the appearance of moderate cachexia. The heart was slightly enlarged to the left. The abdomen was distended symmetrically by a soft cystic mass, containing a softer area 3 cm. above the umbilicus. There was evidence of free fluid in the abdomen. To the right of the umbilicus was a bluish-red, firm, immobile mass about 2 by 3 cm. in the skin, and rising above its surface for 2 cm. Many dilated veins were visible. Bimanual examination revealed a complete procidentia with evidently some herniation of intestines into the inverted vagina. The prolapse was easily replaced, because of the almost complete absence of the pelvic floor muscles. The mass in the abdomen appeared to be continuous with the uterus and adnexa. The urine contained a trace of albumin. The blood findings were HB 70 per cent; R.B.C. 4,290,000; W.B.C. 7,400 with 71 per cent neutrophiles; 25 per cent small lymphocytes and 4 per cent large lymphocytes. The sedimentation time was forty-two minutes; blood pressure 156 systolic, 78 diastolic. Temperature was 98.8°, pulse 76, respiration 18. With the findings as given a diagnosis of procidentia of uterus and of multilocular cystadenoma, with probable malignant degeneration and abdominal wall metastasis was made. Operation was advised.

At laparotomy, the peritoneal cavity contained large quantities of serous fluid. The cystic mass in the abdomen was found to arise from the right ovary, was approximately 45 cm. in diameter, and free from adhesions. The surface was hemorrhagic in spots and irregular, with many hard nodules in the wall. The opposite ovary was free from growth, atrophic and calcified. The tubes were normal. The uterus was atrophic, very soft, and friable. There were no other masses in the pelvis. The liver contained a small nodule just below the gall bladder, 0.5 cm. in diameter. The gall bladder was soft and emptied readily. The stomach was apparently free from involvement. The omentum on its extreme left contained a nodule about 8 to 10 cm. in diameter, stony hard and irregular. This was excised. On the abdominal wall in juxtaposition to the omental mass was a small, hard nodule, and the parietal peritoneum contained several nodules, which were not excised. The ovarian tumor was removed. The uterus was fixed in the anterior abdominal wall, to relieve the procidentia. The patient made an uneventful recovery following the laparotomy, and thirteen days later a high rectocele repair was done as a second step in relieving the procidentia. The patient recovered from this, but very soon thereafter began to complain of weakness and fullness in the abdomen. On May 11, 1927, the liver was palpable 5 cm. below the costal margin; temperature, pulse and respiration were normal. The patient felt well enough to be out of bed, but soon became so weak as not to be able to sit up. On June 20, 1927, the right chest showed evidence of the free fluid, and nodules 1 to 2 cm. in diameter could be palpated under the skin of the lower abdomen. The patient at this time ran an evening fever and vomited occasionally.

On July 8, 1927, the abdomen showed evidence of free fluid. The patient rapidly declined and died on August 7, 1927.

Surgical Specimens.—The specimen removed at operation consisted of a huge, rounded cyst measuring 22 cm. in diameter (after formalin fixation). The outer surface was relatively smooth but contained a number of areas of hemorrhage which were slightly raised. No tumor nodules were seen on the outer surface, but the inner surface was covered by a variety of nodular growths, most of which were short, small, conglomerate and dispersed projections. Several of these were distinctly papillary and cauliflower in appearance. A number of others were rounded, flattened nodules varying from 1 to 4 cm. in diameter. On cut section it was seen that these nodules were composed of the same type of tissue as the wall of the cyst, with which they insensibly merged. The tissue of the wall of the cyst was fairly firm and almost homogeneous, here and there small islands and streaks



Fig. 1.—Section through cyst wall, showing papillary character. X75

of yellow tissue being visible. The wall of the cyst varied considerably in thickness, averaging about 1 cm. One large, rounded area of the wall, about 6 cm. in diameter, was markedly thinned out and soft, and measured in its thinnest portion only 3 cm. The thickest portion of the wall, through the largest of the tumor nodules, measured nearly 2 cm. The papillary projections from the inner surface were most numerous at one pole, and in this region a number of small cysts were present. The fallopian tube was plastered over the surface of the cyst to which it was firmly adherent. The fimbriae, however, were free. With this specimen was a large nodule of omentum, composed mostly of irregularly distributed, pale yellow nodules and strands embedded on a grey, translucent background, and a nodule from the abdominal wall covered by skin, directly beneath which the tissue was apparently made up of the same type of tumor as in the omentum.

Microscopic Examination (Dr. Oscar T. Schultz).—In a section through one of the slightly papillary areas (Figs. 1 and 2), the dense fibrous stroma contains a number of cystic spaces of variable size lined by a single layered epithelium

which varies in height from cuboidal to cylindrical. Projecting from the inner surface are a few short papillary outgrowths covered by similar epithelium. Except for one small area, in which the stroma is more cellular and has the appearance of ovarian stroma, the stroma is very dense. The epithelium shows no invasive characters. The greater portion of the cyst wall is composed of very dense, hyalin fibrous tissue, in which are more cellular areas of variable size. Such areas are made up of elongated spindle-shaped cells whose cytoplasm is longitudinally fibrillated. The nuclei are elongated and contain coarsely granular chromatin in a clear nuclear plasm. Some of the nuclei have parallel sides with rounded poles. Intermingled with the spindle cells are mono- and multinucleated giant cells. Their nuclei are rounded, vary greatly in size, and are often lobulated. They also contain rather coarsely granular chromatin. Some of the giant cells are vacuolated.



Fig. 2.—Section from wall of cyst, showing cellular sarcomatous tissue. X65

Toward the inner surface of the cyst the tissue is largely degenerated and necrotic; here and there a small area is covered by a single layer of columnar cells. The tube is closely attached to the surface of the cyst, the wall of the former going over into the cyst wall. The folds of the tubal mucosa have disappeared, the mucosal stroma is dense, and the epithelium is low. The omental mass (Fig. 3) still contains a few fat lobules, but is composed chiefly of dense fibrous tissue like that of the wall of the cyst. In this tissue are cellular areas of spindle-shaped cells with giant cells. In the nodule from the skin anastomosing bands of deeply eosin-stained cells traverse the connective tissue. The cells in the bands are elongated, are similar to those in the cyst wall, and the same characteristic giant cells are present. In an area of considerable size the subepidermal tissue is necrotic, the necrotic material being surrounded by proliferating connective tissue which contains many large, swollen histocytes, some of which are filled with blood pigment. The cystic tumor is a combination of a papillary cystoma of the ovary and a sarcoma derived from smooth muscle.

Necropsy Findings.—At necropsy, performed August 7, 1927, numerous extensive metastases were found in nearly all of the viscera. Most of the right lung was replaced by innumerable nodules, many of which were situated near the periphery of the lung. The left lung also was involved but to a less marked degree, containing about twenty-five nodules. The largest nodule in each lung was about 6 cm. in diameter. The heart contained several poorly defined nodules of tumor extending from the epicardium toward the endocardium, in several places involving the bases of the papillary muscles. Over the surface of the heart was an extensive fresh fibrinous exudate lightly binding the pericardial surfaces. The liver, although weighing only 1400 gm. was studded with tumor nodules varying in size up to 4 or 5 cm. in diameter. About one-fourth of the liver tissue appeared replaced by tumor. In the spleen were several tumor nodules; the largest located at the periphery, measured 2 cm. in diameter. The left adrenal was diffusely invaded by tumor tissue, forming a mass 4 cm. in diameter, but the right adrenal



Fig. 3.—Omental metastases composed of spindle cells. X70

was free. In the right kidney only a few metastases were present and these were all small, but in the left kidney were a number of small nodules, as well as one which had grown to a size of 3 cm.

A number of tumor nodules were present in the anterior abdominal wall, all anterior to the peritoneum, several being external to the aponeurosis of the external oblique. Others were present in the greater omentum and the mesentery of the ascending colon. On the right side of the vertebral column in the lower lumbar region was a large mass of firm tumor tissue through which the vena cava ran. This vessel was almost completely surrounded by tumor and in one small area the wall of the vein appeared invaded. One side of the aorta, too, was firmly adherent to the tumor mass, but the wall was not involved.

On microscopic examination of the necropsy material the tumor tissue was seen to be of the same character as the specimens removed at operation. Large areas of necrosis resulting from tumor infarction were seen in all the involved tissues, especially the liver, kidneys and lungs. In places this necrosis was accompanied

by hemorrhage, in other areas organization of the infarcted zones had begun, with fibrous tissue proliferation and slight lymphocytic infiltration. In the kidneys, lungs, and adrenals a number of vessels were occluded by compact tumor tissue. Several stages of differentiation of the tumor cells were visible in the various tissues, and in fact, in small portions of a single tissue. In general, the cells were large, rounded, with single vesicular nuclei, but in many places markedly elongated cells were present which were considered as representing fairly well differentiated smooth muscle cells. Other cells were giant in size and contained as many as six nuclei. Mitotic figures were plentiful in all the tissues. With the Van Gieson stain, the cytoplasm of the tumor cells in the elongated as well as the smaller, rounded ones took the yellow stain. With this stain it was also seen that the tumor was growing without any apparent fibrous tissue stroma, only a few small strands of red-staining tissue being present in the tumor nodules, and these may well have been remnants of the tissue destroyed by the tumor invasion. In sections of the uninvolved ovary, there were a few small cysts in the cortex lined by low columnar epithelium which in one place was seen to be continuous with the peritoneal surface of the ovary. These were thought to be peritoneal cysts rather than being minute cystomas of the ovary.

SUMMARY

Numerous instances of two coexistent types of neoplasm have been recorded, including benign and malignant tumors of various kinds, but as far as we know a case similar to ours, in which a benign papillary cystoma of the ovary, from which, we believe, the highly malignant smooth muscle sarcoma arose, has never been reported. Leiomyoblastoma is not at all a common tumor especially in old age. On the other hand, papillary cystomas are not infrequent, and because of their tendency to assume malignant characteristics is common knowledge, diagnosis of a malignant tumor of this type was made clinically on the basis of a cystic pelvic tumor and abdominal wall metastases. From the appearance of the tissues seen at operations we can feel reasonably certain that the sarcoma arose from the ovarian mass, but we can no more than suggest the possible sites of origin of the malignant growth.

CHORIOADENOMA AND CHORIOCARCINOMA OF UTERUS*

BY SAMUEL A. WOLFE, M.D., F.A.C.S., BROOKLYN, N. Y.

From the Department of Pathology, Long Island Medical College and the Departments of Obstetrics and Gynecology of the Greenpoint and Long Island College Hospitals

CHIORIOEPITHELIOMA of the uterus designates a malignant tumor derived from chorionic epithelium. Sanger, in 1889, reported the first case which followed an eight weeks' abortion. Interpreting its origin from the maternal decidua, he accordingly employed the term "deciduoma malignum." Pestalozza, in 1891, studied a malignant hydatid mole with vaginal and pulmonary metastasis, but traced the histogenesis of the tumor cells to placenta epithelium. In 1895, the first paper of Marchand appeared on the subject. He recognized the origin of the tumors from both of the chorionic layers, but since the syncytium was then believed to arise from the uterine mucosa and the Langhans cells from the fetal epiblast, these tumors were considered of combined fetal and maternal origin. In his second communication in 1898, Marchand traced the syncytium to the fetal ectoderm and first employed the term "chorioepithelioma malignum." In this publication, Marchand recognized a series of progressive changes in fetal chorionic epithelium as follows:

1. The simple hydatiform mole.
2. The perforating or destructive hydatiform mole, in which the mesoblastic fibrous core of the villus is retained. The epithelium is hypertrophic. Both elements as a unit invade the vessels of the uterine wall.
3. The pure chorioepithelioma in which the fetal mesoblastic tissue is lacking, the epithelial cells actively proliferate and invade the myometrium and its vessels.
4. Indefinite forms in which the villi are only occasionally noted. They are generally associated with hypertrophied and irregular epithelial cells of syncytial type.

In 1910 Ewing somewhat similarly grouped these cases and correlated the simple hydatid mole, the destructive mole or chorioadenoma destrumes, the chorioepithelioma or choriocarcinoma and the atypical form of syncytioma. The latter represents a degenerative process and is not strictly a neoplasm. Veit presents a similar classification but emphasizes that chorioadenoma is not primarily a malignant growth. The local destructive effects in this group and the vaginal deposits are the result of mechanical transportation of villi which normally occurs

*Read at a meeting of the Brooklyn Gynecological Society, October 5, 1924.

during pregnancy. Mechanical plugging of the veins with its resultant hemorrhage accounts for local destruction of tissues.

Etiology.—Chorionic tumors are associated with the pregnant state and follow abortion, labor, and hydatiform mole. Though generally appearing within several months, cases are recorded after a lapse of five to ten years between the last pregnancy and onset of the disease. Fertility is an important predisposing factor and Teacher notes that although 4.7 per cent of cases occur with the first pregnancy, the incidence rapidly mounts until 37.8 per cent are noted in women who have borne five or more children. This results from the great frequency of hydatiform mole occurring in the fourth decade of life. In a series of 188 cases of chorionic tumors recorded by Teacher, chorionic tumors appeared as follows: After hydatiform mole 36.6 per cent, after abortion 31 per cent, after labor 28 per cent, after tubal pregnancy 4.4 per cent.

J. Veit particularly emphasizes the importance of preceding hydatiform mole and believes that partial hydatiform mole always precedes chorionic tumors, even though the former is only demonstrable by microscopic examination.

Pathology.—In this presentation Ewing's classification of chorionic tumors will be followed for the cases reported typically fall into chorioadenoma and choriocarcinoma groups.

1. *Chorioadenoma Destruans* (perforating mole).—In this group the uterus is found moderately enlarged. On incision the cavity is regular but the tumor growth produces an elevation at the site of fetal implantation. This is covered by necrotic shaggy, hemorrhagic tissue. The myometrium presents single or multiple hemorrhagic nodules. The latter are round and oval in form and vary considerably in size from 4 to 20 mm. In advanced cases they reach the serous coat of the organ and can even be traced into the broad ligament, cervix, vagina, and tube. Histologically chorioadenoma destruans retains the parent stamp of the chorionic villus. The central connective tissue core and the epithelial cells are retained. The villus, however, has entered the uterine vascular sinuses, in contrast to the hydatiform mole where it is only implanted on the surface. The destructive effects are essentially local in action and are largely the result of thrombosis and rupture of mechanically obstructed vessels. The stroma of the villus may be more cellular than normal. The Langhans cells are increased in number forming multiple layers lying at the base of the villi or at some distance from them. The cells are large and more deeply staining than normal. The syncytium is comprised of well nourished buds. Chorionic wandering cells lie free in the blood spaces, the walls of the veins and in the myometrium, but this represents only an accentuation of chorionic invasion which normally occurs during every pregnancy. Metastasis is rare and generally limited to the pelvic zone. In the

strictest pathologic sense these represent mechanically transported villi which have become lodged in contiguous veins of the vagina and parametrium. The hemorrhagic nodules result from secondary thrombosis of the vessels and hemorrhage into the adjacent tissues. This pathologic fact explains the clinical paradox of cured cases of "chorioepithelioma" when only excision of a vaginal nodule or incomplete removal of the uterine lesion has been performed. Secondary true malignant degeneration can and does occur in these transported villi. It is then histologically recognizable by the absence of the stromal core of the villus and multiplication of anaplastic, Langhans and syncytial cells. Even in these cases as shown by Veit, the original uterine tumor may still present only evidence of chorioadenoma. The ovaries present changes in one-third to one-half of cases of chorioadenoma and choriocarcinoma. They are generally enlarged and cystic. The latter are generally of the follicular, theca-interna and lutein varieties, the latter predominating. As emphasized by Schroeder, the hypertrophic chorionic cells stimulate the ripening of primordial follicles which proceed to lutein formation without follicular rupture. Clinically this tumor group produces symptoms of hemorrhage which are severe and progressive. Secondary infection of the uterine cavity and resulting sepsis is a frequent occurrence. Occasionally the villi penetrate the uterine wall, tear the peritoneal coat and produce intra-abdominal bleeding. Transportation nodules are not uncommon in the vagina. The source of danger in this group lies in the progressive blood loss, the potentiality of infection and secondary true malignancy. Complete extirpation of all pelvic viscera is therefore indicated and is generally associated with a fair prognosis. Ewing records fifteen cases with recovery, all of which presented secondary vaginal deposits.

These clinical and pathologic characters are demonstrated by case of Mrs. M. C., No. 2031, aged forty-one, admitted to the service of Dr. Jewett, at the Long Island College Hospital, on March 20, 1927, for vaginal bleeding. The patient stated that on Jan. 9, 1927, a hydatiform mole was removed at the Italian Hospital. Because of continued bleeding, a second curettage was performed at home on Feb. 6, 1927. Staining, however, persisted and on the night of admission, the patient was seized with severe abdominal cramps and profuse bleeding. Previous medical and surgical history were irrelevant. Menstruation began at twelve, recurred regularly every 28 days for three to five days. Last menstrual period occurred in November, 1926. Patient married twenty-one years ago; 10 pregnancies, all resulting in full-term, normal deliveries.

Physical Examination: The patient presents a secondary anemia. Examination of eyes, ears, nose, throat, and neck are negative. The lungs are normal except for an occasional râle over both bases posteriorly. Heart is normal. The abdomen presents moderate tenderness in both lower quadrants, more marked on the left and is otherwise negative. Extremities are negative. **Pelvic Examination:** External genitalia are normal; relaxed marital introitus; cervix is deeply lacerated, more extensively on the left side. The uterus is enlarged to the size of a three months' pregnancy. Adnexa are not felt. Parametrium, negative, no vaginal nodules present. **Laboratory Data:** Urine normal, blood pressure 125/98, red blood cells 3,600,000, hemo-

globin 52 per cent, white blood cells 6,400, polys 69 per cent, lymphocytes 25 per cent, transitionals 3 per cent, eosinophiles 3 per cent. X-ray examination of the lungs, spine, and long bones fail to show evidences of metastasis. On March 29, 1927, complete hysterectomy and bilateral salpingo-oophorectomy were performed. The postoperative course was uneventful. The convalescence was slow and the patient was discharged on the fortieth day postoperative, free from symptoms. The abdominal wound was healed, the vaginal wall was normal. Patient was seen in the Out-patient Clinic March 23, 1928, and was free from symptoms; the pelvis was found normal and free from exudate.

Examination of the specimen presents changes as follows: Uterus: The organ has been removed by panhysterectomy and measures 11 cm. from fundus to portio, 7 mm. transversely and 4½ cm. in thickness. Is is pyriform in shape and fairly firm in consistency except for an area on the posterior body and fundal walls 3 cm. in diameter where it is softened. The peritoneal coat is smooth; no



Fig. 1. (x 30)—Case 1. Note the two edematous chorionic villi lying in a large, venous sinus of the myometrium. The broad mantles of Langhans and syncytial cells are prominent. These findings are typical of chorioadenoma.

adhesions are present. On section the canal measures 9 cm. from the external os to the fundus. The squamous lining of the portio is normal. The endocervical mucosa is normal and the canal proper measures 4 cm. in length. The cavity of the body and fundus presents a parchment-like mucosa over the anterior and right lateral aspects. The posterior body wall and fundus presents an irregular mass which measures 3 cm. in diameter. It is hemorrhagic and covered by necrotic debris. On section through the uterine wall in this zone, the muscle layer presents numerous round or oval nodules varying from 20 to 35 mm. in diameter which are distinctly red and hemorrhagic. Though generally confined to the inner half of the myometrium, several have reached the vascular layer. Microscopic sections taken through this site present a lining of fibrinoid material in which are large clusters of syncytial giant cells. All traces of mucosa are lost. The myometrium presents hemorrhagic areas in its inner half. Many of these are thrombosed veins and sinusoids. The vessel walls and the adjacent muscle fasciculi are necrotic and

invaded by large numbers of syncytial giant cells which are intermingled with numerous lymphocytes. In several of the veins the lumen contains single or multiple villi. (Figs. 1 and 2.) The central core presents mucoid degeneration and is free from blood cells. It is covered with wide sheets of Langhans cells which are distinctly hypertrophic. Focally variation in size and shape of the nucleus is encountered. The syncytium presents in large vacuolated masses generally lying at the periphery of the proliferating Langhans cells or irregularly intermingled with them. These changes can be traced to the level of the main vessels in the myometrium. The subperitoneal muscle layer is normal. The serosa is normal. Remote from the site of tumor implantation, the endometrium presents inflammatory exudate. The muscle layer, however, is normal.

Left Adnexa: Tube measures 85 mm. in length, 5 mm. transversely in the isthmus and 7 mm. at the ampulla. The serosa is congested but the tube is normal in form and contour. The fimbriae are normal. The abdominal ostium is patent.



Fig. 2. (x 80)—Case 1. Note the stroma of the villus and broad sheaths of Langhans cells intermingled with vacuolated syncytium. They lie free in the vein lumen in chorionadenoma.

Microscopic examination presents congestion. Left ovary is roughly ovoid in shape and measures 33 by 24 by 17 mm. and contains numerous cysts. The largest of these is located in the lower pole and measures 2 cm. in diameter. On section the lower pole of the organ contains the corpus luteum of pregnancy. The lutein column is wide, canary yellow in color, and measures 2 to 3 mm. in thickness. The central cavity measures 1 cm. and is lined by a thin layer of connective tissue. At the upper pole there is a cystic cavity measuring 18 mm. in thickness and compactly filled with blood. Small follicular cysts are encountered in the cortex. The stroma is edematous and contains several theca cysts. Microscopically: The germinal epithelium is only occasionally encountered. The tunica and cortex are sclerotic and contain numerous engorged vessels. The large veins show subinvolution sclerosis. The corpus luteum presents an irregular central cavity lined by a broad mantle of maturing fibrous tissue. The lutein column proper is of varying thickness and convoluted. It is well organized and contains numerous septa and blood vessels.

The lutein cells are round or oval in form with pink cytoplasm and with a large vesicular nucleus. Fatty change or calcareous degeneration is lacking. There are no persisting theca interna cells. The cysts grossly noted represent recent and old granulosa cysts. The granulosa cells as a rule are poorly shown but the underlying theca interna is generally prominent and is comprised of multiple layers of large ovoid cells which simulate lutein cells. Engorgement of capillaries is prominent in this layer. In the medulla sinusoidal capillaries are numerous and closely set. The large vessels show subintimal sclerosis. The largest cyst grossly noted is of granulosa cell origin and presents a zone of hemorrhage in the theca externa. Clusters of lutein cells are found irregularly distributed in the stroma or form the lining of atresic follicles or regressing corpora.

Right Adnexa: Tube measures 9 cm. in length, 5 mm. transversely at the isthmus, and 9 mm. at the ampulla. It is normal in contour and convolutions. The serosa is slightly injected. Fimbriae project beyond the patent ostium; several are cystic. The lumen is patent; mucosa, muscle and serous coats are injected. Microscopic examination confirms these findings. Right ovary is roughly ovoid in shape and measures 28 by 24 by 20 mm. It is cystic in character. The tunica is thickened. On section it presents numerous cysts. The medulla contains an ovoid cavity measuring 12 by 8 mm. filled with translucent serofibrin lined by a thick grey membrane. Congestion is prominent. Microscopically: The germinal epithelium is fairly well preserved. Tunica and cortex are sclerotic and markedly congested. The entire organ as grossly noted is filled with cysts. Several of these are distinctly of granulosa cell origin. Some of these present hyperplasia of the theca interna cells not as prominent, however, as in the opposite organ. The gelatinous cavity grossly noted is lined by a single layer of fibroblasts surrounded by broad zones of theca interna cells. Occasionally these are so large as to stimulate true lutein. The medulla is practically replaced by the cysts as previously noted.

This case presents a history of antecedent hydatiform mole. Curettage could not remove the villi which invaded the uterine veins, and hemorrhage followed rupture and thrombosis of the veins. No "transport nodules" were present. To date the patient is well and symptoms free. Typical pathologic changes in the uterus and ovaries were present.

2. *Choriocarcinoma*.—In this group the prototype of chorionic villus is not reproduced for the central stromal core is lacking. Epithelial anaplasia is the rule and true metastases are widespread. The uterus generally is normal or slightly enlarged in size. On section the placental site is marked by the seat of a compact, opaque tumor which is generally hemorrhagic due to extravasation of blood into the tumor proper and the contiguous invaded myometrium. At the periphery, the structure is best preserved and is recognized by its opaque grey appearance. When advanced necrosis has occurred a ragged cavity in the myometrium marks the tumor site. Microscopically: These tumors are comprised of large masses of syncytium irregularly intermingled with broad zones of Langhans cells. The latter are generally compact and arranged in broad irregular sheaths centrally placed in the epithelial masses. Although they may present changes of simple hyperplasia, marked anaplastic variation in size, shape, and staining capacity is frequent. Metastases are early and widespread and in order frequently occur in the lungs, vagina, and brain. Clinically, this group

presents the symptoms of vaginal bleeding but hemoptysis or hemiplegia may be the first abnormalities noted. Intraperitoneal rupture and hemorrhage occurs. Death generally results from uterine hemorrhage, sepsis, and metastases. Though radical extirpation of all pelvic viscera has been the surgical rule, the prognosis is generally hopeless and Ewing finds no recorded cases of operative cure following true choriocarcinoma.

The clinical and pathologic features of choriocarcinoma of the uterus are presented by the case of Mrs. D. C., aged twenty-one, No. 16195, admitted to the service of Dr. Charles A. Gordon, of the Greenpoint Hospital, on Aug. 17, 1927, complaining of irregular vaginal bleeding. Previous medical and surgical history are essentially negative. Patient is married two and a half years. Her first pregnancy terminated in a complete spontaneous abortion in July, 1926. Patient was first admitted to the Greenpoint Hospital May 15, 1927, complaining of bleeding, after a period of amenorrhea of three months' duration. The uterus was found enlarged to the size of a five months' pregnancy. Diagnosis of hydatid mole was made and was accordingly evacuated by anterior vaginal hysterotomy. The patient was discharged May 29, 1927, and was free from bleeding. On June 28, 1927, menstruation appeared and continued for ten days. On July 12, however, bleeding recurred and continued until July 22. Bleeding reappeared on Aug. 7 and persisted for four days. There was no bleeding on admission to the hospital. Physical examination presented no abnormalities in head, neck, thorax, or abdomen, except for mild pallor. Pelvic examination presented normal external genitals; introitus nulliparous. Cervix was enlarged, irregular and thickened anteriorly. On inspection the anterior lip was swollen and presented a blue black color. Profuse bleeding from this site followed manipulation and required packing. The uterus proper was normal in size and consistency; anterior in position. The right adnexa were normal in size. The left ovary was found enlarged, cystic and prolapsed in the culdesac. On Aug. 24, 1927, curettage of the uterine cavity and biopsy from the anterior lip of the cervix was performed. Both specimens were reported as "Chorioepithelioma." X-ray examination of lungs was then made and no metastasis was present. On Aug. 31, 1927, supravaginal hysterectomy and bilateral salpingo-oophorectomy were accordingly performed. The postoperative course was uneventful and the patient was discharged on Sept. 22, 1927, with a well-healed abdominal wound. The cervical stump was well healed except for a small area of granulation in the left fornix. Parametria were free. Follow-up examination to date shows the patient to be in good general health. Pelvic examination fails to reveal presence of recurrence in the vagina or adjacent to pelvic tissue there are no pulmonary symptoms.

The pathologic findings are as follows: Uterus: The organ has been removed by complete hysterectomy. It is symmetrical in form, contour and convolution and measures after fixation 11 cm. in length, 7 mm. transversely and 4 cm. in the anteroposterior diameter. The external os is oval in form. The squamous lining of the portio is intact but the thickened anterior lip is blue black in color and reflects underlying blood. On incision the cervix is elongated and measures 3.5 mm. from internal to external os. The anterior wall of the cervix presents an ovoid hemorrhagic tumor mass which measures 38 mm. long by 10 mm. transversely. Its upper pole stops 15 mm. from the internal os. Inferiorly it reaches the portio; anteriorly it reaches the surface and pre-cervical fascia; posteriorly it extends within 1 mm. of the post-cervical fascia. The body of the uterus measures 4 cm. in length. The mucosa is smooth but is hemorrhagic in the right lateral wall. The myometrium in this area contains a hemorrhagic nodule, round in form which

measures 4 mm. in diameter. (Fig. 3.) The muscle layer varies from 15 to 20 mm. in thickness. The serosa is normal. Microscopically: Section from the anterior lip of the cervix presents changes as follows: The squamous lining of the portio is focally preserved. The underlying cervical stroma is infiltrated by masses of Langhans and syncytial cells. The former occurs in broad, irregular cell clusters comprised of sharply defined cuboidal and ovoid cells. Cytoplasm is clear; the nuclei are vesicular but vary moderately in size, shape, and form. Large clusters of syncytial cells generally surround these masses. No trace of villi are present. Similar masses of malignant tissue can be traced into the endocervical canal. Here growth has been more extensive. Glands and muscle have been destroyed and converted into irregular necrotic debris heavily infiltrated with recent and old hemorrhage. Section from the uterine body at the site of the hemorrhagic nodule grossly noted presents changes as follows: The lining epithelial layer is normal. The endometrium is thin; the stroma is of the fibroblastic type and heavily infiltrated with lymphocytes and plasma cells which extend into the muscle layer. At the site of the nodule necrosis of the myometrium has occurred. The nodule is comprised of irregular necrotic debris in which the vessels still persist and present thrombosis. They are surrounded by a broad mantle of lymphocytes



Fig. 3.—From Case 2. Note the hemorrhagic tumor tissue in the body and cervix. The cystic condition of the ovaries is well shown.

and syncytial giant cells which follow the course of numerous dilated and prominent venules and sinusoids. The myometrium, remote from the site of the hemorrhagic nodule, is normal except for irregular dissection by numerous capillary and lymphatic sinusoids. The large arteries and veins present subintimal sclerosis. In the fragments obtained by curettage preliminary to hysterectomy, large clusters of malignant Langhans and syncytial cells are encountered and are recognized in the mucosa and the underlying muscle of the uterus (Fig. 4). Left Adnexa: Tube is symmetric in form and contour, but its convolutions are accentuated in the outer third. It measures 80 mm. long, 4 mm. transversely in the uterine junction, and 9 mm. transversely in the ampulla. The ostium is patent; the fimbriae are injected. No abnormalities are noted on section. Left ovary is enlarged and measures 50 mm. long, 40 mm. wide and 20 mm. in the anteroposterior diameter. The tunica is smooth, but the external surface is lobular due to many underlying cysts. On incision the organ presents diffuse sclerosis. The cysts are large, numerous and closely set and contain serous fluid, clear or slightly brown in tint. The cysts vary from 3 to 20 mm. in diameter. The lining epithelium is thin, grey white in color. The surrounding stroma is compact. At the junction of the lower pole and the free convex border a solid lutein body is present and measures 14 by 8 mm.

The central cavity is minute and barely recognizable. The lutein column measures about 4 mm. in thickness. Microscopically: The tunica and cortex present sclerosis. Primordial follicles are less numerous than in the opposite ovary. The large cystic spaces grossly noted are comprised of two types: Typical granulosa cysts with broad mantles of small theca interna cysts; secondary larger cystic cavities containing serofibrin and blood. These are focally lined by layers of lutein cells varying from 10 to 20 cell layers. They are round or oval but vary in size and staining intensity. A defined theca interna as such cannot be recognized. The lutein body grossly noted presents essentially an organized cavity supporting numerous engorged capillaries. The lutein column is comprised of 15 to 20 layers of hypertrophic cells with large, fatty cytoplasm supporting vesicular nuclei (Fig. 5). Fibrous septa are numerous. Theca interna cells are not recognizable at the periphery. Theca externa cells are prominent. The medulla shows scattered islands of lutein cells. The blood vessels present changes as noted in the opposite

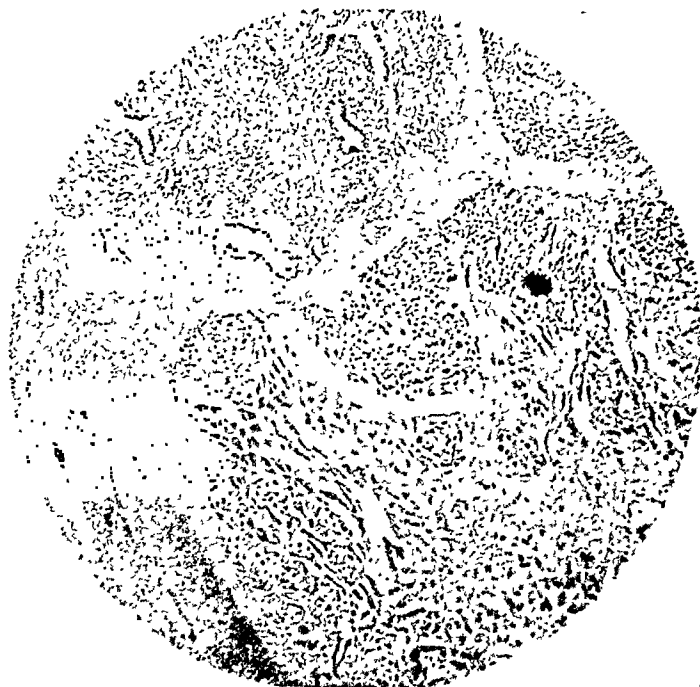


Fig. 4.—From Case 2. The broad mantles of Langhans cells intermingled with synectial giant cells are prominent. The villi are not reproduced. These findings are typical of choriocarcinoma. The glands and stroma are from uterine endometrium, at the site of the tumor nodule in the body as noted in Figure 3.

ovary. Right Adnexa: Tube is symmetrical in form, contour, and convolution and measures 80 mm. long, 4 mm. transversely at the uterine junction and 5 mm. in the outer ampullar area. The serosa is smooth. The abdominal ostium is patent; the fimbriae are normal except for a Morgagni cyst. No abnormalities are noted on section. Right ovary is ovoid in form and measures 30 mm. long, 25 mm. wide, and 20 mm. in the anteroposterior diameter. The tunica is smooth and thickened. Moderate numbers of underlying cysts are encountered. On section the organ presents diffuse sclerosis. Numerous small cystic spaces varying from one-half to 3 mm. in diameter are scattered through the cortex and medulla. The largest presents a yellow lining epithelium. Microscopically: The germinal epithelial layer is lacking. The tunica and cortex are sclerotic. The latter contains large numbers of well preserved, numerous, large, closely set granulosa cysts. The central cavity of the lutein cyst contains serofibrin and recent blood which is succeeded by a layer of organizing connective tissue. This is followed by a lutein column of

varied thickness which is only focally encountered. The cell layers vary from 3 to 20 in number. The cells proper are varied in size; generally they are round or oval in form, with abundant cytoplasm supporting large vesicular nuclei. Numerous fibrous septa are everywhere encountered. Where the column is lacking the cyst lining is formed by a solitary layer of flat or cuboidal cells. The medulla shows moderate sclerosis. Subinvolution sclerosis of the large arteries and veins is prominent particularly in the cortex. Capillary congestion is a prominent feature.

This case of chorioepithelioma was anteceded by hydatiform mole. The unusual occurrence of the tumor simultaneously in the cervix and body may be explained by implantation of tumor tissue into the lower segment during hysterotomy for removal of hydatid mole or more likely by retrograde metastasis. Pathologic examination revealed typical changes in the body of the uterus, cervix, and ovaries.

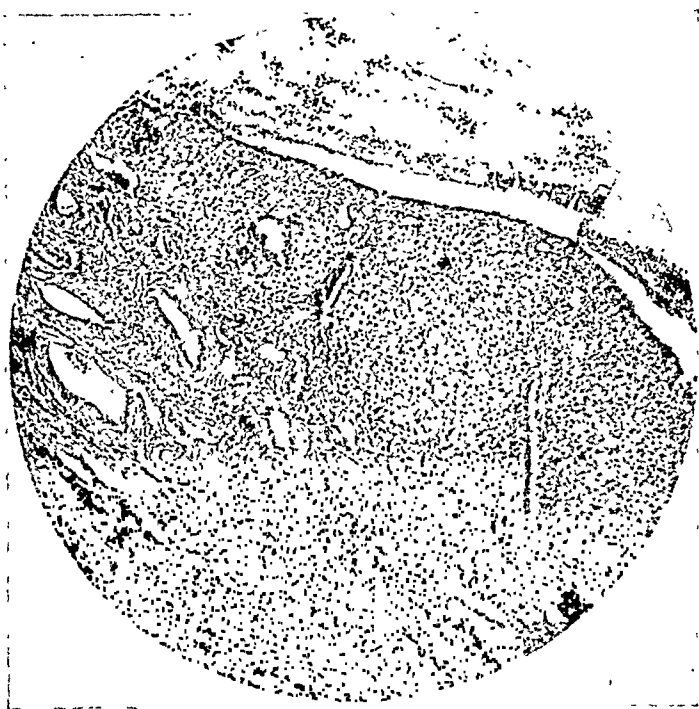


Fig. 5. (x 30)—The lining of the lutein cyst is well shown (Case 2). Note the wide column of typical lutein cells.

CONCLUSIONS

1. Chorionic tumors follow abortion, pregnancy and hydatiform mole.
2. Persisting bleeding after hydatiform mole warrants diagnostic curettage to detect beginning chorioepithelioma.
3. Chorionic tumors comprise two distinct clinical and pathologic forms.
 - a. Chorioadenoma which pathologically reproduces the prototype of chorionic villus. It is locally destructive. Mechanical transplantations of villi into veins of contiguous tissues reproduce secondary tumors. True malignant changes appear secondarily. Radical operation before advent of true malignancy affords a fair prognosis.

b. Choriocarcinoma: The prototype of the villus is not reproduced for the central fibrous core is lacking. There is hyperplasia and anaplasia of chorionic cells which invade the veins and dissociate the uterine musculature. Metastasis is early and systemic, the lung is the favorite site. Radical surgery as a rule is of no avail.

4. Symptom-free cases belonging to each group of chorionic tumors are herein reported one year after operation.

Thanks are hereby expressed to Dr. John O. Polak, Dr. Charles A. Gordon and Dr. William A. Jewett, for their suggestions and permission to report these cases.

REFERENCES

Ewing, J.: Neoplastic Diseases. *Teacher, J. H.*: Chorio-Epithelioma Malignum. *New System of Gynecology, Eden and Lockyer* 2: 555. *Veit, J.*: *Handb. d. Gynäk.* 3: 887.

1530 PRESIDENT STREET.

(For discussion, see page 882.)

VARIX OF THE UMBILICAL CORD WITH REPORT OF A CASE

BY FRED L. ADAIR, M.D., F.A.C.S., AND ROBERT E. McDONALD, M.D.,
MINNEAPOLIS, MINN.

(From the Obstetrical and Gynecological Division of the Minneapolis General Hospital)

THE relative infrequency with which tumors of the umbilical cord occur makes the study of the various types an interesting subject. Especially is this true of tumors of the cord arising from the fetal vascular system, for this type of tumor including both the varix and the aneurysm is probably the least common. Considerable importance attaches to the development of umbilical tumors due to the deleterious influence exerted upon antenatal life of the fetus.

Vascular tumors present aspects of more than academic interest. The intrauterine life of the infant depends largely upon the integrity of the tumor wall which may or may not rupture as development proceeds. Death of the fetus may occur not only from rupture of an umbilical varix or aneurysm, but from impairment of the circulation due to compression of the venous or arterial wall or narrowing of the lumen of the vessel by the enlarging tumor.

LITERATURE

A small number of cases of anomalies of the umbilical cord have been reported. Among these only three true varices were found.

Pluskal^{1, 2} has reported two instances of varix of the umbilical cord. One was said to be the size of a hen's egg, situated about 15 cm. from the placental insertion. The inner surface was "minced and torn." The child was dead before delivery, but no statement is made of

whether or not rupture into the amniotic cavity occurred. The other case reported by this author was in a young secundigravida who began to pass dark red blood when the membranes ruptured four hours prior to the delivery of a normally developed dead infant showing marked anemia. Five inches from the placenta there was a ruptured and collapsed varix. When examined it was found to be the size of a hazelnut.

Lawton³ found a tumor the size of a medium "jargoneth pear" with its neck communicating with the vein through the umbilical opening. This occurred in the funis of a well-developed living child and was ligated and freed a few days after delivery with no untoward effects upon the child. When examined the structure of this tumor was found to be venous and it contained blood.

A tumor, the size of a hen's egg, reported by H. J. McDougall,⁴ was dissected after delivery and found to be made up of layers of fibrin and blood coagulum. Injection of the vein with the specimen under water showed a transverse fissure in the vein about the center of the tumor. A diagnosis of false aneurysm was made.

Siegfried Stocker⁵ described a small tumor the size of a dove's egg found in the middle of an otherwise normal cord. It appeared as a bluish swelling in the cord at which point the vein was widened so that its lumen was about two centimeters in diameter. After removal of a firm but unorganized clot a rupture about the size of a pinhead was disclosed. The infant was stillborn in this case.

REPORT OF A CASE OF UMBILICAL VARIX

In January, 1928, a case with a large varix of the umbilical cord was delivered on the obstetric service of the Minneapolis General Hospital. Several interesting features were revealed in studying this tumor.

M. P., a primigravida, twenty years old, was admitted to the hospital Jan. 29, 1928, in labor. Past history and family history were essentially negative. The mother of the patient had thirteen children, all born alive. The last menstrual period began June 10, 1927. The expected date of confinement was about March 17, 1928. Patient had prenatal care in the Out-Patient Department. Her pregnancy had been entirely normal throughout. At 3 P.M. on the above mentioned date, she was admitted in premature labor, pains having begun twelve hours before. The membranes were unruptured. Two days prior to the onset of labor the patient began to have headaches, rhinitis and diarrhea which lasted one day.

Physical Examination.—The patient was a small woman, hyposthenic in type, with a rather sallow skin. Lungs and heart normal. Blood pressure 98/56. Abdomen was the usual ovoid type of pregnancy with the fundus of the uterus palpable at a point midway between the umbilicus and xiphoid process. Palpation revealed the breech in the fundus, back on the left, extremities to the right, and the head engaged in the pelvis. No fetal heart was audible at any time after admission although it had been distinctly heard in the left lower quadrant at the last prenatal visit one week previously. There was no edema of the extremities.

Pelvic measurements normal: 26.5; 31.0; 32.5; 19.5; 8.0. Rectal examination: effacement 50 per cent, dilatation 3 cm., and the head was slightly below the spines; over-riding of the fetal cranial bones was elicited. Diagnosis: pregnancy at seven and one-half months; position O. L. A.; dead fetus.

Labor progressed satisfactorily with strong pains coming every three to four minutes. The first stage lasted fifteen hours and the second twenty-five minutes. Ten minutes after the cervix had attained complete dilatation the membranes ruptured at the height of a severe pain. The amniotic fluid contained a large quantity of dark blood. Fifteen minutes later the patient was delivered of a stillborn male infant with marked pallor and very slight maceration of the extremities. Progress in delivery of the cord was momentarily arrested while a tumor the size of a grapefruit passed through the introitus. A rupture about one centimeter in length situated nearer the fetal pole of the tumor was noted. The placenta separated readily and, with the exception of several white infarcts and anemia, appeared normal.



Fig. 1.—Product of conception complete after delivery. White marker indicates site of rupture in the vixix. Maceration of the child's skin may be seen. Note infiltration of the cord and fetal surface of the placenta with blood.

DISCUSSION

The exact time that fetal death occurred cannot be accurately known so we must necessarily be guided by the patient's statements and the state of preservation of the fetal skin and parts at the time of delivery. The patient stated that she had not felt fetal activity for three or four days prior to delivery. Two days before she had begun to have headaches and diarrhea and a feeling of general malaise. These symptoms may or may not be attributed to the death of the fetus in utero and the absorption of toxic products into the maternal circulation. In all likelihood the baby was not dead more than two or three

days, the period during which the mother had felt no fetal life. The baby was fairly well developed, premature, and weighed 1750 grams. The crown-heel measurement was 43.5 cm., and the crown-rump 29 cm. The menstrual age of the fetus was about 35 weeks. The crown-heel length indicated an age of about 34 weeks.

One may obtain a fairly good impression of the size of the umbilical tumor from the illustrations, Figs. 1 and 2. From the fetal pole to the placental pole the tumor measured 12.2 cm. and through its greatest breadth 9.8 cm. These measurements were taken with the varix in a state of partial collapse, so very probably it was considerably larger when distended with blood before the rupture took place.

Gross examination at the time of delivery showed the tumor to be undoubtedly vascular in origin since its cavity contained a residue of

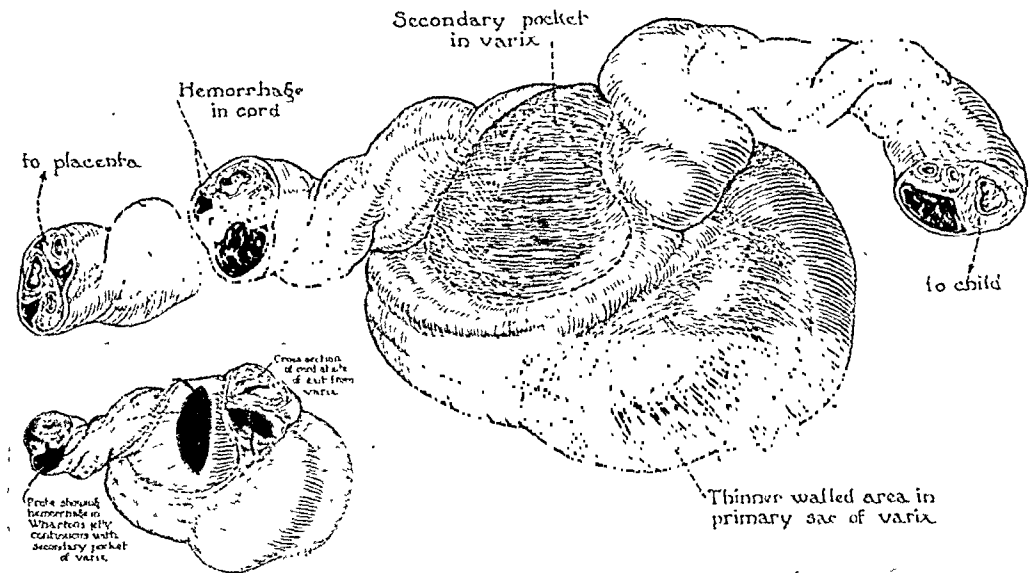


Fig. 2.—Schematic illustrations showing primary and secondary varix cavities with hemorrhage into the cord and the relations of the arteries and vein.

old dark blood. Furthermore its rupture expelling blood into the amniotic sac had caused the death of the fetus by exsanguination. The first impression, however, was that of an aneurysm of the umbilical cord, and it was not until a few simple tests had been made that the diagnosis of varix was definitely established. The cord at either side of the tumor was not abnormal in structure but was noticeably thickened and boggy due to infiltration with blood under the amniotic tunic. On the fetal side blood extended up to the baby's umbilicus while in the opposite segment of the cord it had infiltrated Wharton's jelly up to the insertion of the cord into the placenta and there spread diffusely beneath the membrane for several centimeters around the placental insertion of the cord.

The one main cavity of the tumor was divided into two lesser antra by a partial septum of thickened intimal tissue extending diagonally

across the base. This division resulted in one large cavity constituting slightly more than one-half of the whole and one smaller cavity having two small pockets. Since no one of these cavities was completely circumscribed and in itself a separate entity, all received the main blood supply of the tumor. Colored fluid was injected through the vessels in the cut ends of the cord from both sides of the tumor. When injected through the arteries it could be followed through the vessels which had their course in the tumor wall. None of this fluid entered the tumor cavity but flowed from the vessels at the opposite end of the cord. Injection through the vein from either end of the cord brought the fluid immediately into the varix cavity and established the diagnosis. Fig. 2 shows the arteries in the tumor wall.

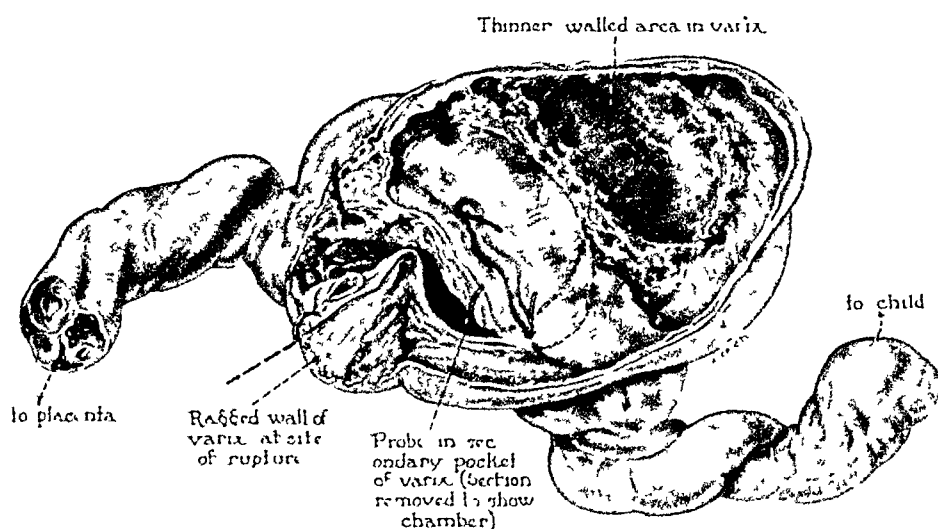


Fig. 3.—Shows primary pocket of varix lined with deposits of fibrin. This also shows the venous openings into the varix cavity.

Probes were passed through the vein and may be seen to extend through two separate venous channels in the region of the partial intimal septum (Fig. 3). This seems to indicate a bifurcation of the vein as it passed through the base of the tumor or two venous openings into the varix cavity. The entire upper two-thirds of the varix wall were extremely thin. In apposition with the cord segments, or the wall previously referred to as the base of the varix, considerable intimal thickening was found.

SUMMARY

1. In reviewing the literature on cord anomalies only three cases of varix were found. The largest of these was the size of a hen's egg. One case of false aneurysm, probably a varix, is reported.

2. Three types of varicose tumors are recognized among these five cases reported. Three are of the thin-walled type with a relatively large cavity; one a small tumor with thickened walls and containing organized clotted blood, and one is described as simply a dilatation of the vein as it entered the umbilicus.

3. In our case, when the membranes ruptured early in the second stage of labor, a large amount of old blood discoloring the amniotic fluid was released.

4. The fetus was stillborn in a pallid state. It had been exsanguinated by rupture of a large varix of the umbilical cord.

5. The time of rupture cannot be definitely stated but probably occurred about two or three days before the onset of labor when the mother first noticed cessation of fetal movements.

6. The case reported is one of ruptured umbilical varix and adds one to the four cases which we have been able to find recorded in the literature.

REFERENCES

- (1) *Pluska*, F. S.: *Oesterreichische Med. Wehnschr. Gaz. Medicale*, 1844. (2) *Pluska*, F. S.: *Oesterreichische Med. Wehnschr.* 26: 701, 1843. (3) *Lawton*, F.: *London Obst. Tr.* 7: 210, 1866. (4) *McDougall*, H. J.: *Dublin Med. Press* 11: 125, 1844. (5) *Stocker*, S.: *Correspondenz Blatt Schweizer Aerzte* 14: 87, 1884.

LA SALLE BUILDING.

THE TREATMENT OF LEUCORRHEA*

BY FRANKLIN L. PAYNE, M.D., PHILADELPHIA, PA.

(From the Gyneccean Hospital Institute of Gynecological Research, University of Pennsylvania)

FOR YEARS the treatment of leucorrhœa has been one of the most difficult problems confronting the gynecologist. The frequency with which this condition is encountered and the intractibility of the complaint to the ordinary forms of office treatment have resulted in thorough study of the condition from the viewpoint of its pathology as well as that of treatment. Years ago Cullen of Baltimore showed that the endometrium is rarely the seat of chronic endometritis, and this statement was later amply confirmed by the epoch-making studies of Adler and Hitschmann. As a result it is now recognized that the great majority of leucorrhœas are of cervical origin. Lack of appreciation of this point is still only too common among ill-informed surgeons, who frequently perform curettage when the only lesion present is a cervicitis. In these cases the removal of normal endometrium is useless, and the danger of spreading the infection from the cervix to the corporeal endometrium, and hence to the tubes and pelvic peritoneum, is apparent.

The structure and function of the cervix is such that it is frequently

*Read at a meeting of the Philadelphia Obstetrical Society, May 3, 1928.

subjected to trauma and infection. It is composed of fibromuscular tissue, covered by vaginal skin and lined with a true mucous membrane. The epithelium of the vaginal skin is similar in many respects to that of the derma. The mucous membrane which lines the canal is composed of columnar epithelium, and through it numerous cervical glands open into the canal. The squamous epithelium covering the portio thins out as the external os is approached. Approximately at this point an abrupt transition occurs into the columnar epithelium of the cervical canal.

In some instances the columnar epithelium extends outward beyond the external os, becoming slightly papillary in character, to form the so-called congenital erosion. The glands of the cervix are compound racemose in character. They penetrate the mucosa into the fibromuscular layer. In the nullipara most of the glands open into the canal, although a few may be found having their exits on the portio. The glands are lined with high columnar epithelium similar to that of the surface of the mucosa. They are mucus secreting at all times during the actual sexual life of the woman. As a result the cervical canal is normally filled with a thick tenaceous mucus which acts as a barrier, protecting the normally sterile canal and uterine cavity from contamination from the vagina.

In the nulliparous cervix, infection generally begins as an endocervicitis and is usually an ascending type. For this reason the brunt of the infection is usually borne by the lower portion of the cervical canal. This fact should be borne in mind in the treatment of cervicitis. In the event of a laceration the cervical canal is partially everted, and its mucous membrane is at once subjected to a variety of infective organisms. A superficial zone of inflammatory reaction is established, giving rise to hypertrophy and overgrowth of the mucosa, which results in the so-called erosion of the cervix. A glandular and periglandular inflammation is produced stimulating an excessive outpouring of mucus, which constitutes the leucorrhoea of which the patient usually complains. The ducts of the glands may become occluded thereby developing the Nabothian cysts so frequently encountered. The presence of excessive mucus, both in the glands and in the canal, definitely interferes with the effective treatment of this condition by local applications, as such remedies cannot reach the seat of the infection. Even if the infection were eradicated, it would doubtlessly recur unless the eversion is repaired. No doubt with local applications temporary improvement does occur, but the majority of these patients eventually return suffering from recurrence of the disease.

Diathermy has been employed in the treatment of cervicitis with varying degrees of success. Apparently in the hands of experts this procedure is of considerable value, especially in the milder forms of the disease.

Some years ago Curtis of Chicago suggested the employment of radium in the treatment of cervicitis and since has reported a number of series of cases treated by this method. As employed by Curtis, no ill effects have followed. Except in the hands of an experienced radiologist this method is not without danger, for if unwisely used sterility and amenorrhea may result. In the cases reported by Curtis and by Norris the results have generally been good, but considerable time is often required to effect a cure. Irradiation has a definite place in the treatment of cervicitis, but the cases should be carefully selected.

In the John G. Clark Gynecological Clinic at the Hospital of the University of Pennsylvania the more severe cases of cervicitis have

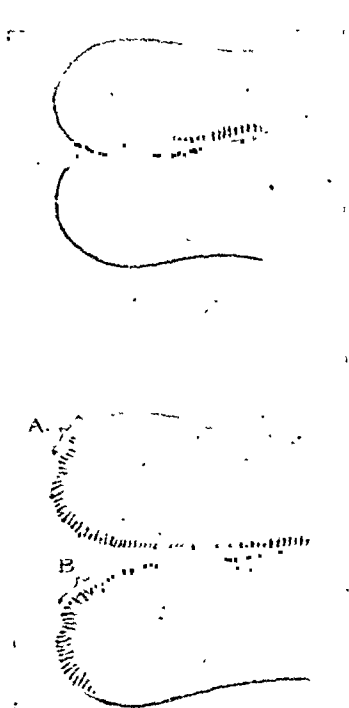


Fig. 1.



Fig. 2.

Fig. 1.—Diagrams of a normal (upper) and a lacerated and everted cervix (lower). Note in the normal the extension of the vaginal covering (modified derma) up to the external os with abrupt transition to endocervical mucosa at this point. In the everted cervix the canal has been thrown open. The mucosa then exposed to the trauma and infection of the new vaginal location has become thickened and hypertrophied and has extended out upon the portio to form a bright red and velvety area easily distinguishable from the surrounding squamous epithelium. Figs. 2 and 3 are taken from A and B respectively.

Fig. 2.—Magnification 69x. Erosion of the cervix. Showing the junction of the stratified epithelium of the portio, with the hypertrophied mucosa which normally lines the cervical canal. Microscopic areas of desquamation of the columnar epithelium are present, giving rise to true erosions of the cervix. Beneath the erosion the glands and ducts are dilated, and the stroma is infiltrated and edematous, giving evidence of chronic infection. This is not seen in the area lying beneath the normal stratified epithelium.

been treated by a plastic operation or by the employment of the cautery. Three types of treatment were utilized: cauterization, simple trachelorrhaphy, and the modified Sturmdorf operation. We have closely studied the end-results obtained in 171 cases treated by one method or the other. All the patients were admitted to the hospital

and subjected to general anesthesia. This study shows that each of the three methods has definite indications and limitations, making it unwise that one should be employed to the exclusion of the others. The choice of procedure should depend upon the type of lesion present.

The cautery was routinely employed in cases of superficial laceration, simple erosion, and in uncomplicated cervicitis. Added to this group is a small number of cases in which the cervical lesion indicated a more radical method, but because of some other pelvic condition which necessitated a prolonged operation, the cervical lesion was treated by the more rapid cautery method.



Fig. 3.—Magnification 276x. Papillary erosion of the cervix. Section has been taken through the area of eversion. The surface and glandular epithelium exhibit alterations resulting from chronic infection. The changes are more marked on the surface than in the depths of the glands. Here and there degeneration is observed, but for the most part the epithelium is intact. The lumens of the glands contain a considerable quantity of mucus, epithelial debris, and leucocytes. The stroma also shows the result of long standing inflammation. It is edematous and infiltrated with chronic inflammatory products. This is especially noticeable toward the surface. Lesions of this character are obviously extremely intractable to all forms of local treatment. They can be permanently cured by the use of the cautery or by a plastic operation.

The technic for cauterization of the cervix, as performed in the Clark Clinic, is as follows: The field of operation is prepared as for an ordinary plastic operation. The depth of the cervical canal is carefully estimated. A large electric cautery is employed. The tip is heated to the point at which the dull red appears. This is introduced into the cervical canal an average distance of 2 cm., special care being exercised not to destroy the integrity of the internal os. Four linear marks are made along the wall of the canal, dividing its circumference into quadrants. Radial striations are then made from the ex-

ternal os to the periphery of the cervix, resembling the spokes of a wheel. These lines are 3 to 5 mm. in depth, varying somewhat with the requirements of the individual case. The number of striations also varies with the size of the cervix, the average being ten to twelve. Several points are observed: the necessity for leaving an untouched area between each line of cauterization; the importance of evacuating any Nabothian cysts present; and the fact that too extensive destruction of the cervical mucosa will lead to stenosis of the canal with dystocia, should pregnancy subsequently occur. Patients treated with the cautery are kept in bed three days after the operation and discharged upon the fifth day. There is often a small amount of bleeding for the first twenty-four hours. Occasionally on the eighth to the tenth day rather severe bleeding occurs as a result of separation of the sloughing area. The patients are advised to expect a decided increase in the discharge for a period of four to six weeks and to use a cleansing vaginal douche as needed. Each patient receives instructions to return to Follow-Up Clinic for inspection at intervals of three, six, twelve and twenty-four weeks following discharge from the hospital.

This detailed follow-up has enabled us to determine the rapidity of the subsidence of the leucorrhea following each form of treatment. It was longest delayed in the cautery cases because of two factors: the prevalence of deep-seated infection and the destructive action of the cautery. The destruction of large amounts of mucosa and more or less underlying muscular tissue, as is done by the cautery, necessitates a prolonged process of sloughing and repair. The contraction of the cicatricial tissue which results from this treatment plays a considerable rôle in the subsidence of the leucorrhea. The completion of the healing process requires weeks. Hence the removal of diseased tissue by operation produces its beneficial results earlier than does the cautery.

A remarkable change occurs in the appearance of the cauterized cervix. The formerly large, injected, edematous organ becomes one of normal appearance. In cases of superficial laceration the process of fibrosis and contraction practically restores the normal cervical canal. In the event of deep or multiple lacerations entire restoration to the normal will not occur. In such cases the cautery is not indicated. The use of the cautery gave the following results:

<i>No. Treated</i>	<i>Cured</i>	<i>Improved</i>	<i>Average Time to Effect Cure</i>
70	76%	17%	11.6 weeks

Trachelorrhaphy was performed in cases presenting simple unilateral or bilateral lacerations. Into this group fall the cases in which the normal contour of the cervix could be restored by simple denudation of the everted lips and the approximation of these edges by interrupted catgut sutures. Those cases of laceration presenting marked inflammatory, cystic, or hypertrophic changes were not treated by trachelor-

raphy. The patients upon whom this operation is performed are discharged about ten days subsequently. They are also seen in Follow-Up Clinic at six-week intervals. The following results were obtained:

<i>No. Treated</i>	<i>Cured</i>	<i>Improved</i>	<i>Average Time to</i>
24	75%	21%	<i>Effect Cure</i>
			10.3 weeks

The modified Sturmdorf operation was employed in those cases in which the lacerations were multiple, or sufficiently severe to prevent anatomic restoration by trachelorrhaphy, in cases of hypertrophy both with and without Nabothian cysts and in a few cases of extensive cervicitis. We have excluded from this series cases of marked hypertrophic elongation and those in which prolapsus was the chief feature.

The procedure employed is based upon the technic described by Dr. Sturmdorf, with a few modifications. Care is taken not to cone out the cervical tissue the entire length of the canal. The fact that the infection rarely extends to the internal os justifies the effort to conserve as much of the cervical mucosa as possible. This observation is borne out by the results we have obtained with the employment of this technic. Only in cases of extensive cervicitis is it necessary to cone out the entire gland-bearing area up to the internal os. The Sturmdorf inverting stitch is used for the anterior and posterior flaps of the cervical skin. In addition two or three lateral sutures are placed on either side for the purpose of hemostasis. These sutures are placed as they are in the usual trachelectomy. No. 1 twenty-day chromicized catgut is used throughout the operation. Despite these precautions in a few instances delayed bleeding is experienced following this procedure. This generally occurs from the eighth to the tenth day. (It is probably the result of defective catgut.) Consequently these patients are kept in bed ten days and are discharged at the end of two weeks. They also are instructed to return to Follow-Up Clinic after six weeks have elapsed. The results were as follow:

<i>No. Treated</i>	<i>Cured</i>	<i>Improved</i>	<i>Average Time to</i>
77	77%	18%	<i>Effect Cure</i>
			8.5 weeks

In order to gain a clearer perspective of the indications for each of these procedures, we have divided the cases into four groups, as seen in Table I. This division is based upon the predominating pathologic condition as seen at the time of operation. No cervix actually presents one lesion without varying degrees of the others. Yet one lesion usually predominates sufficiently to permit this classification.

The first group is composed of the cases in which infection played the greatest part; the cervicitis group, numbering 27. In the second group are those cases presenting simple lacerations, numbering 24. In the third group multiple lacerations with erosions predominated, numbering 85. Included in this group are a few cases of congenital ero-

sion; all of the latter were treated by cauterization. The fourth group of 35 cases is composed of those with distinct hypertrophy, with and without Nabothian cysts. A study of the following table will show the method of treatment and the results obtained in each group.

TABLE I

NO. CASES	OPERATION	CURED	IMPROVED	UNIMPROVED	AVERAGE TIME TO EFFECT CURE
<i>Cervicitis</i>					
24	Cautery	79.3%	8.3%	12.4%	11.9 Weeks
3	Sturmdorf	33.0%	0.0%	66.0%	4.0 Weeks
<i>Simple Laceration</i>					
24	Trachelorrhaphy	75.0%	21.0%	4.0%	10.3 Weeks
<i>Laceration With Erosion</i>					
44	Cautery	73.0%	18.0%	9.0%	9.5 Weeks
41	Sturmdorf	69.0%	29.0%	2.0%	9.2 Weeks
<i>Hypertrophy Cystic Changes</i>					
2	Cautery	100.0%	0.0%	0.0%	16.0 Weeks
33	Sturmdorf	91.0%	6.0%	3.0%	11.4 Weeks

The cases of uncomplicated gonorrheal cervicitis were most resistant to treatment. Recovery was longer delayed in this group, an average of eleven weeks being necessary for subsidence of symptoms. Only three of these cases were treated by the Sturmdorf procedure; of these, two cases continued with leucorrhea, one of which showed evidence of reinfection. The factor of reinfection plays a decided part in the apparent failure of treatment, both operative and nonoperative, in patients suffering from gonorrheal cervicitis.

Of the 27 patients with cervicitis 11 were nulliparous. Several had been treated for acute Neisserean infection, with partial or temporary disappearance of the leucorrhea. Of these 11 patients, all of whom were treated with the cautery, 82 per cent were cured or decidedly improved in an average time of from five to twelve weeks.

In the group of lacerations and erosions it will be noted that about an equal number was treated by the Sturmdorf procedure as by cauterization, with approximately similar results.

The Sturmdorf operation was preferred in cases of hypertrophy or with marked cystic changes. Of 33 cases so treated, 30 were cured and 2 improved, giving an average of 97 per cent.

CONCLUSIONS

1. In the treatment of leucorrhea each case should be approached as an individual problem. The method of treatment should depend upon the predominating lesion which the case presents.

2. Of 171 cases of leucorrhea, the predominating lesion proved to be: cervicitis in 27, simple laceration in 24, multiple lacerations with erosions in 85, and hypertrophy with cystic changes in 35.

3. Cauterization gave 93 per cent cure or improvement in 70 cases. Trachelorrhaphy gave 96 per cent cure or improvement in 24 cases. In 77 cases the modified Sturmdorf procedure gave 95 per cent cure or improvement.

REFERENCES

Mathews, H. B.: J. A. M. A. 87: 1802, 1926. *Curtis, Arthur H.*: Surg., Gynec, Obst. 37: 657, 1923. *Corbus, B. C.*: J. A. M. A. 87: 1816, 1926. *Adler and Hitschman*: Monatschr. f. Geburtsh. u. Gynäk. 27: i. *Graves*: Textbook of Gynecology, W. B. Saunders Co., Philadelphia, 1923. *Norris, C. C.*: Radium in Gynecology, J. B. Lippincott Co., Philadelphia, 1927.

(For discussion, see page 879.)

1907 SPRUCE STREET.

THE TREATMENT OF UTERINE FIBROMYOMAS*

(Series 1925-1927)

BY FLOYD E. KEENE, M.D., F.A.C.S., AND
FRANK B. BLOCK, M.D., F.A.C.S., PHILADELPHIA, PA.

(From the Department of Obstetrics and Gynecology of the University of Pennsylvania)

IN A PREVIOUS report¹ the treatment of uterine fibromyomas as employed in the Department of Gynecology at the University of Pennsylvania was analyzed for the three year period from 1922 to 1924 inclusive, and certain definite deductions were drawn at that time. The present report comprises an analysis of a similar series of cases which were treated between January 1, 1925, and July 1, 1927, and was undertaken for the purpose of determining whether we were closely following the recommendations which were previously outlined as well as for the satisfaction of a careful check-up of our work.

As in the previous series the present study is based on all the cases of uterine myomas which were treated irrespective of how they may have been complicated by other lesions, although in many instances the associated lesions were of more importance, especially from the standpoint of mortality, than the uterine tumor. However, it is believed that only by including all cases can the temptation of rejecting unfavorable ones be overcome and a true survey of the work be presented.

During the period under consideration there were 259 cases treated, of which 161 (62.1 per cent) were operated upon and 98 (37.9 per cent) were irradiated. It was our conviction prior to analyzing the cases that we were constantly operating upon a greater percentage of cases and drawing the indications for irradiation more closely, but by comparison of the above figures with those of the earlier series in which 63.2 per cent were operated upon and 36.8 per cent irradiated, it is seen that they are almost identical and shows the value of a statistical analysis over a mental impression when speaking of past events. In

*Read at a meeting of the Obstetrical Society of Philadelphia, May 2, 1928.

summarizing the cases by separate years, however, it is noted that the percentage of irradiation has shown a steady decline, being 44.7 per cent in 1925, 37.3 per cent in 1926 and 27.5 per cent in 1927. It might be mentioned here that in the latter part of 1925 the late Dr. John G. Clark ceased active work in the hospital so that it can readily be observed that his staff has not only carefully observed his teachings relative to the contraindications to irradiation, which have been published on numerous occasions, but have actually been more cautious about subjecting these cases to this form of treatment than he had been. This does not mean that we are losing faith in the value of radium, but it merely indicates that with further experience it is our opinion that before radium is applied the individual case must run the gamut of contraindications and emerge from the acid test with no black marks against it. In brief, therefore, radium when properly indicated is a very valuable therapeutic measure, but when contraindicated or even when in doubt as to its proper indication it should not be used, as it is a two-edged weapon and has as great potentialities for harm as for good in improperly selected cases. It may be stated,

TABLE I. METHODS OF TREATMENT

	1922-1924	1925-1927	1922-1927
Number treated	422	259	681
Number of operations	267	161	428
Per cent of operations	63.2	62.1	62.8
Number of radium irradiations	153	94	247
Number of roentgen irradiations	2	4	6
Per cent of irradiations	36.8	37.9	37.2

therefore, that in a combined analysis of our two series representing 681 cases, it has been found advisable to subject the patient to irradiation in 37.2 per cent, a very few of which were roentgen irradiations. This latter method of treatment has been employed only 4 times in the present series and its use is confined to patients whose general condition will not permit of operation with any degree of safety and whose tumor is much too large for radium irradiation.

SURGICAL TREATMENT

Complicating pelvic lesions of some type or other were present in 47 per cent of the cases operated upon, and pelvic inflammatory disease was the most common, being present in over 25 per cent of the series. The other complications noted, in order of frequency, were: perforating cysts (Sampson) of the ovary, other types of ovarian cyst, carcinoma of the ovary, carcinoma of the uterus and pregnancy. Combining this experience with that of the previous series in which 37 per cent of the operative cases were complicated, we find that in a series of 241 cases which were operated upon, 44 per cent presented complicating pelvic

lesions. This high incidence of complications serves to emphasize the care which must be used in excluding such cases from irradiation therapy and justifies the dictum "when in doubt, operate."

When operation is decided upon as the therapeutic method of choice, the question naturally arises as to which type of operation should be performed, namely, vaginal or abdominal. If abdominal operation is decided upon, should myomectomy or hysterectomy be selected; and if hysterectomy is selected, should it be complete or subtotal? We believe that each type of operation has its advantages in certain cases and that the features of the individual case will in large measure determine the proper procedure. In our clinic the vaginal operation has been reserved for pedunculated, submucous myomas or myomas of small size associated with uterine prolapse. Needless to state, such cases represent a very small proportion of the cases operated upon and in the present series only 3.1 per cent were treated by vaginal myomectomy while 0.6 per cent were treated by vaginal hysterectomy. In considering operation by the abdominal route we consider myomectomy to be the ideal operation in young women if it can be performed without too much traumatism to the uterus and the conditions indicate that the chances of leaving a uterus that will withstand pregnancy are good. In this series 6.2 per cent of the cases were subjected to this form of treatment. Regarding the choice between complete and subtotal hysterectomy when removal of the uterus is indicated, we realize that a large subject is opened for discussion. If one were to search the literature carefully, as we have done, there would be found so many proponents of each type of operation that the weight of authority might seem equally divided. The major argument used by those favoring the complete operation is that by removing the cervix the possibility of the later development of carcinoma in that portion is entirely eliminated. The rebuttal of the conservatives is that the frequency of carcinoma in the remaining stump is low and does not begin to offset the distinctly higher mortality and morbidity associated with panhysterectomy.

It is interesting to note that of late years some of the ardent supporters of panhysterectomy who have enjoyed a low mortality with this operation have reversed themselves and now state that the complete operation should *not* be done routinely. There is no question in our minds about the subject, as we still adhere to the statement made in a previous paper to the effect that supravaginal hysterectomy should be the operation of choice and panhysterectomy should be reserved for those cases in which the cervix is badly diseased. Even in such cases it is often considered advisable to perform a reparative cervical operation or cauterization in conjunction with a supravaginal hysterectomy in preference to a panhysterectomy. As evidence of our choice in this matter, the analysis of the present series shows that the supravaginal

operation was performed in 86.4 per cent of the cases as opposed to panhysterectomy which was employed in only 2.4 per cent.

In regard to the disposition of the ovaries, we continue to pursue the policy of ovarian conservation whenever healthy ovarian tissue is present; and in this series, notwithstanding the 47 per cent of cases in which complications were present, both ovaries were conserved in 37.9 per cent and one ovary was saved in an additional 24.1 per cent of the operative group. If we consider only the cases in which some type of hysterectomy was done (since ovarian tissue was always conserved in the other types of operation), we find that both ovaries were retained in 31 per cent, one ovary was retained in an additional 27 per cent, making 58 per cent of the cases in which ovarian tissue was conserved.

Postoperative complications showed an incidence of 20.4 per cent which may be subdivided as follows: wound infection 9.3 per cent, pulmonary complications 4.3 per cent, pelvic peritonitis 3.1 per cent, pyelitis 2.5 per cent, general peritonitis 0.6 per cent, phlebitis 0.6 per cent. Aside from an increase in wound infection these percentages closely parallel those of the former series. The mortality, however, reached 3.7 per cent as opposed to 1.1 per cent of the previous series but included in this figure are two cases of carcinoma which will be discussed later.

IRRADIATION TREATMENT

During the period under consideration 94 patients were subjected to radium irradiation of whom 85 (90.4 per cent) were over forty-one years old. In the year 1925 six patients and in 1926 three patients under forty years old were given this treatment though always with reduced dosage, varying from one-quarter to one-half of the standard 1200 milligram-hour dosage. However, our more strict adherence to the proper age group which is entitled to this treatment is evidenced by the fact that none of the cases in the 1927 series was under forty years old. Further analysis of the irradiated cases shows that of the 94 cases, 74 received irradiation alone, 20 had some plastic operation at the time the radium was used and in one case an abdominal operation was performed at the time of the irradiation. This case which was the only fatality in the series was one in which a cholecystectomy was done, the patient dying of intestinal obstruction. While the application of radium could scarcely have had anything to do with this unfavorable outcome, the case must be included in the series although aside from the statistical aspect, the death cannot be charged against irradiation. We were able to trace 57 of the 74 patients of whom 94.7 per cent were cured. Operation was required because of failure of the irradiation in 3.5 per cent of the cases and there were two cases (not included in this series) in which radium was applied to the cer-

vical stump following operation when the histologic study showed carcinoma of the uterus in the removed specimen. Combining the present series with the previous one we can get the advantage of a greater number of cases in figuring irradiation results. These two series represent 247 cases, 86.6 per cent of whom were over forty-one

TABLE II. SUMMARY OF IRRADIATION TREATMENT

	1922-1924	1925	1926	1927	1925-1927	1922-1927
Number of cases	153	46	34	14	94	247
Under 30	2	0	0	0	0	2
31 to 35	4	3	1	0	4	8
36 to 40	18	3	2	0	5	23
Over 41	129	40	31	14	85	214
Per cent over 41	84.3	87	91	100	90.4	86.6
Radium only	98	34	28	12	74	172
Radium and plastic	53	11	7	2	20	73
Radium and abdominal	2	1	0	0	1	3
Number traced	92	34	16	7	57	149
Cured	82	31	16	7	54	136
Per cent cured	89.1	91	100	100	94.7	91.3
Per cent operation required	6.5	5.9	0	0	3.5	5.4
Per cent mortality	0	2	0	0	1	0.4

years old. A cure was obtained in 91.3 per cent, secondary operation was required in 5.4 per cent, and the mortality was 0.4 per cent. Our follow-up study has revealed the interesting fact that while metrorrhagia and menorrhagia have almost always been relieved in both operative and irradiation cases, leucorrhea was unrelieved in 29 per cent of the operative group and in 36 per cent of the irradiation group. Pain was unrelieved in 24 per cent and bladder symptoms in 9 per cent of the operative group. In about 50 per cent of the cases there has been an increase in weight following irradiation. There were four cases subjected to roentgen irradiation with apparently satisfactory results.

Mortality.—The mortality experience of any large group of cases is of interest to surgeon and patient alike and in relation to uterine myomas will be largely influenced by the type of treatment and the associated complicating lesions. As in our previous report we believe it advisable to divide the operative cases into those which are com-

TABLE III. MORTALITY STATISTICS

	1922-1924			1925-1927			1922-1927		
	NUM- BER	DEATH	PER CENT	NUM- BER	DEATH	PER CENT	NUM- BER	DEATH	PER CENT
Uncomplicated opera- tions	169	0	0.0	96	1	1.0	265	1	0.38
Irradiations	155	0	0.0	98	1	1.0	253	1	0.4
Total uncomplicated cases	324	0	0.0	194	2	1.0	518	2	0.39
Complicated operations	98	3	3.0	65	5	7.7	163	8	4.9
Grand total	422	3	0.7	259	7	2.7	681	10	1.46

plicated by other lesions and those which are simple myomas, including intraligamentary growths. In this series, then, there were 96 operations upon uncomplicated tumors with one death, the cause of which a partial autopsy failed to reveal. There were 98 cases treated by irradiation with one death or a total of 194 uncomplicated cases treated with 2 deaths, a 1 per cent mortality. Contrast this with the 65 cases operated upon in whom there were various complicating lesions in the pelvis, of whom 5 died (7.7 per cent mortality), and it is readily seen that complicating disease raises the mortality considerably. The average mortality of all cases, complicated and uncomplicated, operative and irradiated, in this series was 2.7 per cent. This mortality experience is considerably higher than that reported for the three years from 1922 to 1924 inclusive. During that period there was no mortality among the uncomplicated cases and but a 3 per cent mortality in the complicated group. Of course figures do not lie and we might be discouraged by our poor showing in the complicated group except for the fact that a closer analysis of the deaths changes the character of the mortality in our minds although it has no effect on the stony heart of a statistical table. Thus the five deaths in this group consisted of the following cases:

1. Myoma complicated by pelvic inflammatory disease in a diabetic who died of embolism on the eleventh day.
2. Myoma complicated by carcinoma of the ovary in a patient who died of peritonitis on the fourth day.
3. Myoma complicated by pelvic inflammatory disease in a patient who died from a transfusion reaction on the eighteenth day.
4. Myoma complicated by carcinoma of the uterus with widespread metastases in a patient who died two and one-half months after operation although still in the hospital.
5. Myoma complicated by carcinoma of the ovary with ascites and metastases in a patient who died seven weeks after operation.

It is evident therefore that two and possibly three of these deaths had practically no relation to the operation per se, and therefore the high mortality figure which is shown does not really apply to operations for myoma. If we take advantage of the larger number of cases embraced by both the previous and the present series, it will be seen that the mortality in 518 uncomplicated cases was 0.39 per cent which was equally distributed between the operative and the irradiated groups, whereas in 163 complicated cases the mortality rose to 4.9 per cent or 12 times as great. The combined mortality in 681 cases of all types representing the experience in our clinic for five and one-half years was 1.46 per cent. These figures well illustrate that the mortality of the treatment of these cases is almost entirely the mortality of complicating disease.

CONCLUSIONS

As a result of our survey of the present and previous series of cases we feel that the following conclusions are justified:

1. The mortality in the treatment of uterine myomas when uncomplicated by other pelvic disease should be below 1 per cent whether the case is treated by operation or irradiation.

2. The mortality in the treatment of uterine myomas complicated by other pelvic lesions will depend largely on the type of complicating disease but in any event will be materially higher than that of the uncomplicated cases.

3. Irradiation is the treatment of choice in about one-third of all cases of uterine myomas requiring treatment, but it is of great importance to select the cases carefully, and it is well to remember that "when in doubt, operate."

4. In the operative treatment we believe that supravaginal hysterectomy is the operation of choice in the large majority of cases. Abdominal and vaginal myomectomy are useful operations in selected cases, but panhysterectomy is only occasionally to be performed.

5. Ovarian conservation is always to be practiced when healthy ovarian tissue can be retained without interference with its blood supply.

6. Bleeding will be relieved in practically all cases operated upon and in 95 per cent of the cases irradiated, but leucorrhea will persist in about one-third of the cases after either method of treatment.

7. Almost half of the myomas subjected to operation are complicated by other pelvic lesions.

REFERENCE

Clark and Block: AM. J. OBST. & GYNEC. 10: 560, 1925.

MEDICAL ARTS BUILDING.

(For discussion, see page 880.)

Vermelin, H.: Recurrent Placental Sclerosis and Habitual Death of Fetus, *Progrés med.*, October 8, 1927, p. 1567.

Patient had a premature stillbirth with a grossly fibrotic placenta in 2 successive pregnancies. Though there was no history or signs of syphilis, anti-luetic régime was instituted in a third pregnancy. The fetus again was still-born in the seventh month. The placenta was small and sclerotic but examination proved it to be very much less affected than in the preceding specimens. The author believes that obscure hereditary syphilis is no doubt frequently the underlying cause of so-called habitual death of fetus.

GOODRICH C. SCHAUFLER.

RESULTS OF X-RAY THERAPY IN MYOMA AND OTHER NONMALIGNANT LESIONS OF THE UTERUS*

BY GEORGE M. LAWS, B.S., M.D., PHILADELPHIA, PA.

Associate Gynecologist, Presbyterian Hospital

SIX years ago Dr. W. S. Newcomet,¹ radiologist to the Presbyterian Hospital, adopted a uniform technic for x-ray treatment of benign uterine conditions. The gynecologic staff of the hospital referred to him 94 patients in the period from 1922 to 1927 for this treatment. He describes it as follows: Four areas over anterior portions of the pelvis, each two inches square, are exposed four minutes, 10 inches distance, to rays produced by a current of 4 milliamperes, 8 inch spark gap and filtered by 3 mm. aluminum. If a second treatment is given, five similar posterior areas are exposed. In brief it consists of a small dose of roentgen rays repeated if need be, at intervals of six weeks. In urgent cases it has been repeated in four weeks.

Since the dosage is standardized, gynecologists do not have to know much about x-ray therapy in general to advise and request its administration. Usually we prescribe it as a symptomatic remedy for bleeding where it is applicable and discontinue it when the effect has been secured, but it may be given again at a later date. The treatment causes no local symptoms, and there are rarely any perceptible skin changes. We have not observed roentgen sickness of more than a negligible degree.

Myomas.—Having audited our experience the data are presented in groups. Thirty-six patients received x-ray treatment for myoma. In the same period the gynecologic staff operated upon 164 cases of myoma, and treated only seven patients with radium, but radium was not readily available to ward patients (Table I).

TABLE I. FIBROIDS 1922 TO 1927

Treated by hysterectomy	147
Treated by abdominal myomectomy	15
Treated by vaginal myomectomy	2
	<hr/> 164
Total operations	80%
Treated by radium	} 20%
Treated by x-ray	
Duplicates	
	<hr/> 7
	<hr/> 36
	<hr/> 4
	<hr/> 203

*Read at a meeting of the Obstetrical Society of Philadelphia, May 3, 1928.

The relative or absolute contraindications to intrauterine application of radium, so authoritatively expressed by Dr. F. E. Keene,² were present in many of the patients treated by x-ray. Five with organic disease that made operation hazardous and who also had pelvic inflammation, responded satisfactorily to this symptomatic treatment (Table II). We do not hesitate to employ it in the presence of pelvic inflammation.

TABLE II. MYOMA

Contraindications to operation, heart lesions, anemia, obesity, asthma. Contraindications to radium, pelvic inflammation. Indications for x-ray, bleeding.				
NO.	D. & C.	AGE	TREATMENT	RESULT
1	0	33	2	Normal menses
2	0	38	1	Scant menses
3	0	40	1	Improved
4	0	45	5	Controlled
5	+	48	2	Menopause

Five of another group of bad operative risks had tumors larger than those for which radium is indicated (Table III). In women under forty years old the desired control of menorrhagia has usually been accomplished. We know of no patient under forty who has had a permanent menopause from this dosage (Table IV). In older women without bleeding, x-ray may occasionally be tried for pressure symptoms. If curettage is not indicated, hospitalization is not required (Table V).

TABLE III. MYOMA

Contraindications to operation, heart lesions, diabetes, anemia. Contraindications to radium, large tumor. Indication for x-ray, bleeding 4, tumor 1.				
NO.	D. & C.	AGE	TREATMENT	RESULT
6	0	37	1	Improved
7	+	41	3	Controlled (tumor smaller)
8	+	54	2	Controlled
9	0	55	4	Improved
10	0	56	1	Awaiting donor. Hysterectomy

TABLE IV. MYOMA

Contraindications to operation, cerebral lues (No. 12), heart (No. 15), refused (No. 17). Contraindication to radium, age of patient. Indication for x-ray, bleeding (post abortion No. 11).				
CASE NO.	D. & C.	AGE	TREATMENT	RESULTS
11	+	30	1	Normal menses. Tumor disappeared
12	0	32	1	Controlled
13	0	36	3	Controlled three years
14	+	36	3	Controlled, uterus smaller
15	0	37	2	Controlled
16	+	38	2	Controlled
17	0	18	1	Improved

A few patients refused radium treatment and accepted x-ray. In Case 23 the patient had recurrence of hemorrhage one year after radium treatment. She requested x-ray and persisted in her preference for it (Table VI).

Submucous fibroids, three cases, did not respond satisfactorily to treatment (Table VII).

TABLE V. MYOMA

Contraindications to operation, heart (No. 19). Contraindications to radium, no bleeding. Indications for x-ray, pressure.				
CASE NO.	D. & C.	AGE	TREATMENT	RESULTS
18	0	45	3	Relieved, normal menses
19	0	52	2	Relieved, tumor no smaller
20	0	55	1	Relieved partly
21	0	56	2	Relieved, tumor no smaller

TABLE VI. MYOMA

Contraindications to operation, heart, tuberculosis, had myomectomy (No. 22). Refused (No. 24). Contraindications to radium, recurrence after radium (Nos. 22 and 23). Indication for x-ray, bleeding.				
CASE NO.	D. & C.	AGE	TREATMENT	RESULTS
22	0	32	2	Controlled
23	+	41	5	Unknown
24	0	49	4	Controlled for a time by 2 treatments

TABLE VII. MYOMA. SMALL SUBMUCOUS TUMORS

Contraindications to radium, submucous tumor, age of patients (Nos. 25 and 26). Indications for x-ray, bleeding.				
CASE NO.	D. & C.	AGE	TREATMENT	RESULTS
25	+	35	5	Helped for time
26	+	35	2	Failed—hysterectomy
27	+	?	5	Improved

A majority of the patients in Table VIII show ideal indications for radium. The results compare favorably with the results of radium in a similar group, though bleeding was not controlled as promptly.

TABLE VIII. MYOMA. SMALL TUMORS

Contraindications to radium, none. Indications for x-ray, bleeding.				
CASE NO.	D. & C.	AGE	TREATMENT	RESULTS
28	0	41	2	Unknown
29	+	44	4	Controlled
30	+	45	2	Unknown
31	+	46	2	Menopause
32	+	47	2	Unknown
33	+	47	1	Controlled
34	0	48	4	Controlled
35	+	50	3	Controlled
36	0	60	2	Stopped after first treat- ment

Functional Hemorrhage.—(Table IX.) Thirty-five cases variously diagnosed myopathic, metritis, fibrosis, hyperplasia, menorrhagia, etc., were analyzed from the standpoint of clinical findings, and laboratory reports of curettings. The study proved of no value as a guide to results to be expected from x-ray. It strengthened the opinion that the lesion is really ovarian. The failures were in the young women. The results in the remainder were not always ideal but no known patient under forty years old had a permanent menopause as this result was not desired. Some were carried along with occasional treatments to control bleeding. We have, as a rule, avoided x-ray therapy in women who are likely to become pregnant. The only known subsequent pregnancy occurred in a patient who had three treatments at long intervals and was recently delivered of a normal baby, by Dr. P. F. Williams (herein first reported with his kind permission). Curettage is indicated in nearly all of this group as well as myomas and other lesions causing bleeding. None of our patients is known to have developed malignancy.

TABLE IX. FUNCTIONAL HEMORRHAGE

Case Nos. 37 to 73, benign uterine hemorrhage. Functional, myopathic, hyperplasia, etc.			
AGE	NO. OF CASES	KNOWN RESULTS	FAILURE PER CENT
26-34	7	6	33
35-39	8	7	28
40-44	10	8	None
45-52	10	10	None
80 per cent curetted.			
Average number treatments, 2 in each age group.			

Postoperative Inflammatory Cases.—Five patients who had menorrhagia or metrorrhagia after conservative operation responded favorably to treatment (Table X). The confidence that such bleeding can thus be controlled may occasionally permit the operator to be more conservative.

TABLE X. POSTOPERATIVE INFLAMMATORY CASES

Benign Uterine Hemorrhage: Postoperative, inflammatory cases Indications for x-ray, bleeding.				
CASE NO.	D. & C.	AGE	TREATMENT	RESULT
74	0	29	1	Improved
75	0	32	3	Controlled
76	0	30	2	Controlled
77	+	44	2	Controlled
78	0	50	3	Menopause

Miscellaneous.—Two cases of postclimacteric hemorrhage were of interest. Patient No. 79 had had radium ten years before and was found to have atresia of the cervix. Hemorrhage recurred after pa-

tency of the canal was restored by dilatations, but ceased after x-ray. No. 80 was a patient who had persistent bleeding after a negative diagnostic curettage, which, however, ceased after two x-ray treatments.

TABLE XI. MISCELLANEOUS

Benign Uterine Hemorrhage—Postclimacteric				
CASE NO.	D. & C.	AGE	TREATMENT	RESULT
79	+	56	1	Stopped
80	+	56	2	Stopped
81	Puerperal			
	+	32	1	Amenorrhea; pregnancy
	Syphilis			
82	+	22	1	Controlled
	Tubo-ovarian abscess (error)			
83	0	41	1	Failed

Polypoid Endometritis gave poor results in two known cases (Table XII). Three and five treatments respectively resulted in but temporary improvement.

TABLE XII. POLYPOID ENDOMETRITIS

Benign Uterine Hemorrhage—Polypoid Endometritis				
CASE NO.	D. & C.	AGE	TREATMENT	RESULT
84	+	29	3	Temporary improvement, recurrence
85	+	34	5	Temporary improvement
86	+	50	1	Unknown

Dysmenorrhea with associated nervous manifestations was the indication for treatment in patient No. 87, who was forty-one years old. Temporary amenorrhea with improvement led to repetition of treatments totaling nine in four years.

Stimulating dose of x-ray, smaller than the standard dose, was employed in two cases of amenorrhea of one year's duration. One patient menstruated three months later, Case 88; the other failed to show any result from treatment, Case 89.

Five cases, 90 to 94 inclusive, are omitted because of insufficient data.

CONCLUSIONS

It is of real value to a gynecologic service to have x-ray treatments given by a standard dosage until sufficient experience is acquired to prescribe a more ideal individual treatment.

The small dosage herein reviewed has enabled us to extend the field of x-ray therapy so that an increasing number of women are referred for treatment each year. The patient is not restricted in her activities except by hospitalization for curettage which is usually indicated. Therefore in practice, x-ray has one important advantage over radium, particularly if small doses are used and must be repeated. If radium is not at hand at the time of curettage, it is less disturbing to apply x-ray later, e.g., after the pathologic report is received.

The contraindications to small dosage x-ray therapy are few and are practically confined to its effect on ovary and fetus. I wish to thank Dr. J. H. Girvin, gynecologist to the hospital, and Dr. W. S. Newcomet for their cooperation in this study.

REFERENCES

- (1) *Newcomet, W. S.*: J. A. M. A. 85: 1459, 1925. (2) *Keene, F. E.*: Atlantic M. J. 31: 50, 1927.

1907 SPRUCE STREET.

CESAREAN SECTION BY FRITSCH'S TECHNIC WITH A REPORT OF SIXTY CONSECUTIVE CASES WITHOUT MORTALITY

BY JULIUS NIEMACK, M.D., F.A.C.S., CHARLES CITY, IOWA

(From the Cedar Valley Hospital)

STEIN and Leventhal in this Journal (August, 1928, p. 229) published 40 cases of low cesarean sections without a death. They say that the low morbidity of this series could have been attained by no other method of delivery. At the same time they state that their work was all done by a group of obstetric specialists and not general surgeons. With such favorable results these men will, of course, prefer this method to other forms of delivery when a serious case demands interference.

It may be of interest to put on record a series of sixty consecutive cesarean sections which I, a general surgeon, did in a small Iowa town. I had as my assistants general practitioners; the doctor who brought in the case acted as first assistant. Under prevailing conditions this kind of teamwork can only rarely be avoided. The obstetric cases are mostly emergencies, although lately preliminary consultations have become more frequent. The patients had to be accepted in whatever condition they were brought in. Only ten cases of election among sixty is not a favorable proportion for the surgeon who must make the best of it.

In 1915, a few weeks apart, I encountered the two worst hemorrhages of my obstetric practice; both patients were near term, cervix closed, no labor pains. The women arose to use the chamber and fainted, while the blood poured from them. Both lived within three blocks of the hospital. So the transport was speedily managed and the operation done at once. Both mothers and babies lived. In a town of our size the impression was deep and favorable. We physicians too were impressed. A serious hemorrhage near term with the cervix closed or nearly closed has since that time caused a prompt hospitalization, and, if it continued and labor did not promptly start, such a hemorrhage has served as an indication for section. Premature separation of placenta

and placenta previa must both be considered as indications for section, with this one difference, that many of the first kind will do better if a Porro operation is done.

The narrow pelvis is harder to define unless it is outspoken. Where a previous pregnancy had to be ended by the cranioclast, or where well-developed babies were stillborn after hard labor, dead from intracranial bleeding, where in a family all firstborn are dead and the mother is badly torn, in such cases the obstetric surgeon will not readily refuse the entreaties of the family to give them a living child and to do a section. A test of labor has generally been given by the physician in charge and his opinion must be listened to with respect. A head that will not enter the pelvis after hours of strong labor pains will rarely presage a living baby. And my own experience with prophylactic version in just these cases has not encouraged me much.

An old primipara with rigid soft parts and ineffective pains, who wants a live baby under any conditions, cannot be denied. The surgeon who has had good results will naturally be more liberal than his less fortunate confrère. In a case of vagina duplex with only one cervical opening (premature, with dead fetus) we considered the danger of uncontrollable hemorrhage from the septum; weighing this against the known dangers of section we operated and the result satisfied everybody. Three distorted pelvises from scoliosis and an old tuberculosis of the hip were of course considered absolute indications for section. An obstructing fibroma of the cervix had been mistaken for the head entering the pelvis until consultation was called. A Porro was done to save the mother (baby was dead). A timely examination during pregnancy would have averted this disaster. In nephritis, apoplexia, exceedingly high blood pressure and uremic convulsions, I have, with one exception, accepted in consultation the decision of the attendant. The one patient refused had good dilatation and, if she could have been got into shape to do something, could easily have been delivered by forceps. The section for delivering a hydrocephalus was forced upon me by religious prejudice. Clinical and x-ray examination had shown the real condition, but tapping of the head was not allowed by the relatives. I had thus to do a section in the mother's interest, and the monstrous fetus lived for a whole week, certainly a crime against medical science.

One woman with pelvis narrowed by a high promontory had had two sections and absolutely refused sterilization. She lived way out in the country, and I did not see her again until she was brought in with a ruptured uterus and a mature dead fetus with placenta lying among the intestines. Her doctor had not known about her pregnancy. She died notwithstanding a speedy hysterectomy, before blood transfusion could be arranged.

A very adipose woman of about thirty-five years, at full term, was brought in with an advanced state of uremia and went at once into

convulsions. A Porro operation was done at once on account of the unusual heaviness of the uterus. Convulsions continued, and the abdominal wound broke wide open. It was closed again by figure of eight sutures. She made a perfect recovery without hernia. The child lived. I must assume that hysterectomy saved this woman's life. She was in the hospital twenty-four days.

About twenty physicians bring their cases to the Cedar Valley Hospital. Most of the country obstetrics is still done in the homes. But things are improving lately, and with earlier hospitalization cesarean section seems to become rarer. Still the test of labor is generally requested by the family, and this test is relative and individual. When in doubt and the baby lives, the safest way of delivery should be chosen, whatever that may be in the experience of the doctor.

This much about the indications. I did not mean to write about cesarean operation in general but only about the advantages of Fritsch's transverse uterine incision done in the small hospital.

The advantages of this method for country practice appear to me very evident. The uterine incision in the fundus from tube to tube normally meets no spurting vessels. Even a high placental site or distortion by fibromas in my experience has never interfered. The distance between a potentially infected cervix and the uterine wound is the farthest possible. The thickness of the uterine wall in the fundus makes it possible to place three rows of sutures, one on top of the other, to secure broad apposition. The abdominal and uterine incisions are in different directions and planes, and there is no possible chance of forming adhesions. Against the required eventration of the uterus no serious objection can be raised, as we have to keep intestines for a much longer time outside of the abdomen in innumerable cases. Only those postoperative disturbances have been observed in our work, which might have happened otherwise. The abdominal scar is higher up and therefore more favorably located than in the low section. The omentum can be placed flat between fundus and bowels, preventing adhesions and potential intestinal kinks. A Porro operation can be added with hardly any additional consumption of time. Finally, this Fritsch section can be done by any experienced surgeon in about thirty minutes and without any other assistance than the average physician can furnish.

TECHNIC EMPLOYED

As a rule I begin with a five- or six-inch incision in the left paramedian line, one-third above and two-thirds below the umbilicus. The fascia and peritoneum are exposed and opened near the navel, being enlarged with scissors, as the situation demands. Ergot has been given hypodermically when anesthesia begins. Pituitrin should be given at the time of uterine incision. The hand is introduced behind the uterus and coaxes the organ out, either cornu first, helped by lateral pressure on the abdominal walls or lifting of the same. Straightening of the uterus,

grasping of the uterine arteries by the assistant and covering the upper part of the incision with a towel are the next steps. Rarely a towel clip is needed to hold the upper wound together.

An assistant stands ready with a blanket to take the baby; the nurse holds the scissors and clamp to sever the cord. Now the fundus is inspected and transversely incised to the extent required. The knife does not at once cut through the entire muscle but quite naturally cuts one layer after the other. The opening of the membranes needs special care, for very often the fluid has been drained off and the fetus lies in direct contact with the membranes. As soon as a hole is made, this is torn open with the fingers, and the same fingers extract the child, which is taken from my hands as indicated, and then the placenta can be taken care of. The rim of the placenta is nearly always met; occasionally it has to be pushed aside before incising the membranes. If it does not at once fall out under the rapid contraction of the uterus, it is peeled out with the ulnar side of the hand. The membranes either peel easily and go along or are rubbed off with gauze. Small shreds are left alone as long as the whole placenta is secured.

During this stage there is a good deal of parenchymatous bleeding as is unavoidable in any form of speedy delivery. Spurters are noticeably absent. Very rarely an anomalous situation of the placenta has made temporary clamping of a vessel advisable. The preliminary hypodermics, helped along by massage, have secured a good, firm contraction and a diminution of the incision to about 3 inches. Suturing is at once begun with a double, No. 1 chromic catgut. All sutures are continuous; the first one unites the inner layer of muscle and is allowed often to include a bit of endometrium. The second, like a basting stitch, coaptates the middle layer, while the third one includes some peritoneum with the outer muscle. There is always room for these three rows. A Cushing suture is added for perfect peritonealization. Sometimes oozing makes an extra stitch near the cornu advisable.

As the "spill" has not entered the abdomen, the whole toilet is reduced to picking up a few blood clots in the bladder region. The abdominal walls are now lifted, and the uterus slips back into place. The omentum is pulled down between the fundus and bowels and a last inspection made for bleeding.

Closure of abdomen is made as usual, if possible with imbrication near the umbilicus, as the weakest point.

This is the routine procedure. If, however, a Porro operation has become necessary, ligation of the uterine arteries is the first step after extracting the baby. The uterus with the contained afterbirth is pulled up, and a strong, curved, round needle with chromic gut enters from the front into the broad ligament. The left index finger from behind leads it under the pulsating artery and out again above it where it is tied. This is done on both sides. Dickinson's continuous suture hysterectomy follows with hardly any bleeding. These Porro cases are real favorites with the nurses on account of their unusually smooth recoveries.

From the emergency character of most of our cases it is easy to conjecture that the aftercare was not always smooth. But suppurating wounds and peritonitis were not among our complications. Continuation of convulsions in the eclamptics and dynamic ileus in some others came in for the largest part of our worries. I had no cause to be afraid of pituitrin, often, and in full dose. In Fritsch's incision line there seems to be no danger of tearing the muscles apart again. Asafetida enemas, Rehfuß tube and turpentine stupes have repeatedly

proved their value. As a rule there was some temperature reaction for the first two or three days. After that it became normal but showed a second stage of irregularity about the tenth day. There was no malaise with this second rise, and I have laid it to the uterine sutures giving way with some lochial absorption. Only four patients remained feverish for several days after section, only one of them over five days.

The pulse rate in exhausted patients did not always come down so promptly. A few patients were kept in the hospital after healing was perfect only on this account; among them was one woman who had her first pregnancy in twenty married years shortly after thyroidectomy for exophthalmic goiter. Only twelve remained in the hospital more than fifteen days, of these only one for twenty-four days. As a rule they could be sent home on the thirteenth or fourteenth day. Aside from the one eclamptic patient, whose wound burst open, the records show hardly any trouble with the abdominal wound.

The question of sterilization was always left for patient and family to decide. No doctor can demand from any woman that she take larger risks of life and health than he is willing to take himself.

I wish to mention a few cases of rather unusual character that led to hysterectomy. In a dilapidated shack in the woods the bed broke down with the parturient woman as the doctor was pulling hard on the forceps. He was under the impression that he had made a large tear in the uterus and so brought her to operation. There was no rupture of the uterus, but the surrounding conditions had apparently been so very bad that the organ was removed.

In the case of another elderly primipara the old physician had applied forceps repeatedly over twenty-four hours. Another doctor was called who brought her in. Cervix was not fully dilated though she had been in labor over forty-eight hours. In both cases I did a Porro operation after having delivered a living child. The risks of conservatism were too great.

The maternal mortality in our State is still too large. I can at least claim that our work has not made it larger.

SUMMARY

Sixty cesarean operations were done in fourteen years: 58 by Fritsch's method, 2 premature cases by vaginal section; as emergencies 49, by election 11; conservative Fritsch's 45; Porro's 13; recovered mothers 60, living children 56; indications: placenta previa and premature separation 11; narrow pelvis, absolute and relative 37; outspoken eclampsia 7; nephritis (apoplexy) 3; obstructing fibroma and hydrocephalus each 1.

PUERPERAL MORBIDITY AT THE GREENPOINT HOSPITAL*

ANALYSIS OF 1012 CONSECUTIVE CASES

BY DAVID KUPERSTEIN, BROOKLYN, N. Y.

THE cases in this analysis were taken from the obstetric services of Drs. Charles A. Gordon and Thurston S. Welton, and I wish to express my appreciation to them for the privilege of reporting them.

Morbidity statistics from the various hospitals are being published frequently, and the purpose of this study is to analyze the morbidity findings at the Greenpoint Hospital and compare them with the figures elsewhere. In reviewing the literature, it is amazing to note the variety of the standards employed. This factor, with other factors to be mentioned later, made it increasingly difficult to compare the results. The standards are briefly as follows:

1. *American College of Surgeons*.—"A temperature of 100.4° during any two consecutive days exclusive of the first day postpartum."

2. *British Medical Association*.—"Puerperal morbidity should include all fatal cases, and also all cases in which the temperature exceeds 100° on any two of the bidaily readings from the end of the first to the eighth day after delivery."

3. *Congress on Puerperal Infection at Strassburg* (1923).—"Any puerperal case showing a temperature of 100.4° or more, lasting longer than twelve hours or reaching this height on two successive days, excluding the first day and ending on the tenth day."

4. *Johns Hopkins (H. W. Mayes)*.—"Any patient whose temperature reaches 100.4° on two successive days following delivery, not including the day of delivery and occurring not later than the tenth day." In a study made by Mayes at the Methodist Episcopal Hospital where a 4 per cent solution of mercurochrome was used in preparation for delivery, a morbidity of 5.6 per cent was recorded in 566 cases in 1925.

5. *J. B. DeLee*.—"A temperature of 100° or over, while the patient is in the hospital." In a report of the obstetric work done at the Chicago Lying-In Hospital and Dispensary, during the two years 1925 to 1927, 6031 cases were recorded with a morbidity of 10.3 per cent.

6. *H. Bailey (Bellevue Hospital)*.—"A temperature of 100.4° for two consecutive days excluding the first day." In a report of five years activities of the Maternity Service, Second (Cornell) Division, Bellevue Hospital, 4,396 cases showed a morbidity of 9.6 per cent. A 2 per cent solution of mercurochrome was used in preparation for delivery or vaginal examination.

7. *Tracy and First (Jewish Maternity Hospital, Phila.)*.—"A temperature of 100.4° twice in one day excluding the first twenty-four hours." In a review of 1001 cases delivered at the hospital, there was a morbidity of 4 per cent.

8. *Goodall and Wiseman (Hebrew Maternity Hospital, Quebec)*.—"Any temperature that rises above 99° on three consecutive days after the first day postpartum, and also, all those cases which though without temperature, yet are morbid." With such a rigid standard the morbidity reported was between 30 and 40 per cent.

*Read (by invitation) at a meeting of the Brooklyn Gynecological Society, October 5, 1928.

In our analysis of 1012 consecutive cases at the Greenpoint Hospital we have chosen a morbidity standard which is in conformity with that of Johns Hopkins and H. W. Mayes, that is, "a temperature of 100.4° on two successive days following delivery, not including the day of delivery, and occurring not later than the tenth day."

Rectal examinations are used routinely following admission of the patient to the hospital. The mode of preparation of the patient prior to delivery was as follows: Upon admission, the pubic and vulvar regions were carefully shaved and cleansed with green soap and water. After drying, the suprapubic area, thighs, and vulva were painted with a 3½ per cent solution of iodine. When ready for delivery, a second coat of 3½ per cent solution of iodine was applied on the dry skin. All cases were ward cases and were handled by constantly changing resident personnel but the nursing personnel remained constant.

The methods of delivery in our cases were as follows:

Spontaneous	902 cases
Breech	51 cases
Forceps (low)	39 cases
Versions	9 cases
Bag Induction	1 case
Cesarean Sections	10 cases

There were three maternal deaths in the 1012 deliveries or 0.3 per cent. There were 36 cases of morbidity in the 1012 deliveries or 3.55 per cent.

The presentations and positions as recorded in these deliveries were:

Vertex, 959 cases, divided into 869 anterior positions, 85 posterior positions and 6 face positions.

Breech, 51 cases.

Transverse, 3 cases.

We have compared our morbidity statistics with those reported by Mayes in 1925 in 566 cases, taking into consideration the methods of delivery. In 902 spontaneous deliveries there were 23 cases of morbidity or 2.5 per cent; Mayes reported 2.3 per cent morbidity in 382 cases. In 51 cases of breech extraction there were 4 cases of morbidity or 7.8 per cent; Mayes reported 25 per cent morbidity in 4 cases. In 39 cases of application of low forceps (there were no high forceps in this series), there were 4 cases of morbidity or 10.3 per cent; Mayes reported 9.6 per cent morbidity in 125 cases. In 9 cases of version, there was one case of morbidity or 1.1 per cent; Mayes reported no morbidity in 8 cases. In one case of induction of labor by insertion of a Voorhees' bag, there was no morbidity; Mayes reported 9 per cent morbidity in 11 cases. In 10 cases of cesarean section there were 4 cases of morbidity or 40 per cent; Mayes reported 37.5 per cent morbidity in 16 cases.

We have divided our complications in the cases showing morbidity into intrapartum and postpartum complications. In the intrapartum

group there were two cases of manual removal of placenta, and two cases of placenta previa (these cases showed morbidity with no localized lesion of infection). In the postpartum group, there were ten cases of parametritis, four cases of lochiametra, three cases of acute bronchitis, three cases of pneumonia, two cases of pyelitis, one case of acute endocarditis, one case of acute nephritis, one case of phlebitis, one case of wound infection, and six cases had no localized lesion of infection.

The average hospital stay of the cases showing morbidity was thirteen days postpartum, varying from ten to thirty-nine days. Fifteen cases left the hospital on the tenth day postpartum, seventeen between the tenth and twentieth day postpartum, four between the twentieth and thirty-ninth day postpartum.

There were three maternal deaths in the 1012 deliveries. One died one day postpartum from an acute cardiac decompensation, one died twelve hours postpartum from a ruptured uterus following breech extraction, one died seven days postpartum from lobar pneumonia. We have included in our morbidity statistics this fatal case of lobar pneumonia. The other two fatal cases died a few hours after delivery and in accordance with the morbidity standard chosen were excluded.

From this study several facts are apparent:

1. The absence of a uniform standard in the cases reported in the literature renders comparison difficult and it is obvious that the more rigid the standard the higher the morbidity. The failure to record the method of preparation and type of examination renders comparison even more difficult. In all events, the personal element in the nursing and resident medical staff enters into the morbidity no matter what technic is employed, and these factors are not apparent in statistics.

2. The study of cases at the Greenpoint Hospital shows an incidence of infection comparing favorably with other results presented in the literature.

3. Tincture of iodine externally employed as an antiseptic compares well with mercurochrome even when the latter is both externally applied and vaginally inserted.

4. Conservative methods are of paramount importance in decreasing obstetric morbidity.

REFERENCES

- (1) *Bailey, H.*: AM. J. OBST. & GYNEC. 15: 462, No. 4, 1928. (2) *DeLee, J. B.*: Statistical Report 1925-1927. (3) *Goodall, J. R., and Wiseman, M.*: AM. J. OBST. & GYNEC. 16: 339, No. 3, 1928. (4) *Mayes, H. W.*: Long Island M. J. 21: 146-148, 3, 1927; N. Y. State J. Med., 1926. (5) *Tracy, S. E., and First, A.*: AM. J. OBST. & GYNEC. 16: 51, No. 1, 1928.

921 MONTGOMERY STREET.

(For discussion, see page 881.)

REGURGITATION OF MENSTRUAL BLOOD FROM ONE OF DOUBLE UTERI CAUSED BY CONGENITAL ATRESIA

BY EDWARD ALLEN, M.D., F.A.C.S., CHICAGO, ILL.

(*Clinical Instructor of Obstetrics and Gynecology, Rush Medical School and Presbyterian Hospital*)

MUCH discussion has arisen during the past few years concerning the conditions necessary for the implantation or metaplasia of endometrial tissue in the pelvis. Sampson¹ still holds to his original belief that the most frequent source is that of endometrial tissue which has been regurgitated through the tubes into the free peritoneal cavity with the menstrual blood. The irritative action of menstrual blood undoubtedly causes an inflammatory exudation and granulation tissue with the formation of adhesions and peritoneal inclusions which are a fertile soil for the growth of misplaced tissue. This irritant action may also be the stimulative factor if the ectopic endometrium is a result of metaplasia of the coelomic epithelium.

Jacobson² in his transplantation experiments in monkeys and rabbits found that bits of endometrium would "take" more surely if planted in an area which had been scarified to form a fibrin base that would fix or hold the transplant.

Recently we had the opportunity to observe a patient who presented most of these conditions in sequence, and the findings were of sufficient interest that we feel they merit this short report.

Case Report.—Miss A., a Mexican girl, fourteen years old, entered the Presbyterian Hospital March 1, 1927, on the service of Dr. Vernon David, through whose courtesy we are reporting this case.

The patient complained of pain, which had been present for the past three years, in the right lower quadrant of the abdomen. This pain had been associated with nausea but she had not vomited. Constipation during that time had been relieved by enemas. The menstrual period had started on the day preceding the attack. For the past four months she had had intermittent attacks of a similar nature although not so severe. This pain was usually associated with her menstrual flow.

The patient began to menstruate at twelve years every twenty-eight to twenty-nine days, and the flow lasted three to four days. For the first year she did not have dysmenorrhea. The pain at the period time gradually increased until of late she began to have pain two to three days before the flow was established and which lasted throughout the period. The remainder of the general history was negative.

Temperature on admittance was 99° F. and pulse 70. The blood count, was 90 per cent hemoglobin, 4,016,000 erythrocytes and 12,900 leucocytes; urine was negative for sugar or albumin.

Physical examination revealed a well developed girl of about the age given. She did not seem acutely ill. General physical examination normal. There was

no rigidity or distention of the abdomen. Tenderness was present over the entire abdomen but especially over a swelling that filled the lower right quadrant. This tumor was symmetrical, firm and slightly movable.

The external genitalia were normal. On vaginal examination a small infantile cervix could be palpated, pushed to the left wall of the pelvis by a mass directly connected to the abdominal tumor and which filled the right half of the pelvis. The patient complained of marked tenderness in the right fornix when examined.

The preoperative diagnosis was probable twisted ovarian cyst.

Upon opening the abdomen the mass proved to be a uterus, atretic vagina and cervix markedly distended with retained menstrual blood. About 150 c.c. of this blood had been regurgitated into the culdesac through the tube and was exuding from the ostium when the abdomen was opened. As usual in double uteri, only one tube, ovary and round ligament were present on this uterus. All were apparently normal.

On the left side of the pelvis was an undeveloped uterus with its one tube, ovary and round ligament. It was approximately normal in size and shape for a girl of this age.

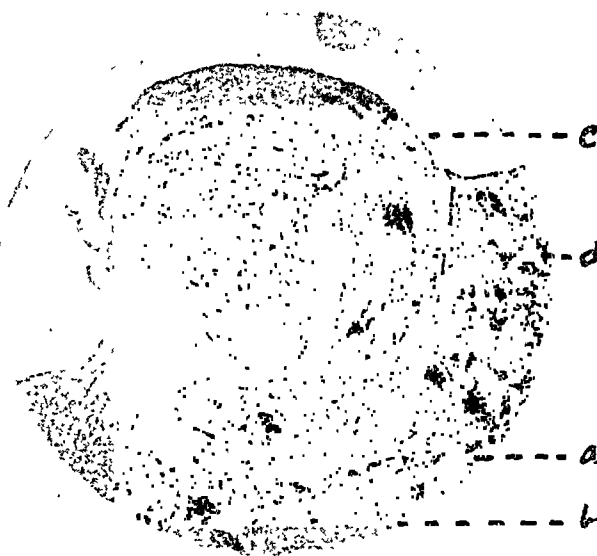


Fig. 1.—Section of tissue removed from lowest end of posterior uterine wall. *a*, normal uterine musculature; *b*, hyalinized tissue; *c* and *d*, granulation tissue.

A finger inserted into the vagina could push up the vaginal vault so that it would pass between the vaginal cervix on the left and the mass on the right which proved to be the atretic vagina and uterus distended with blood.

The pouch of Douglas was covered by a smooth velvety carpet of endometrial-like tissue. Islands of this same tissue were located elsewhere on the peritoneum, several loops of the bowel and omentum.

As much of this tissue and the inspissated blood as possible was removed. The usual ligations were done, and the right ovary, tube and the body of the uterus with the closed vagina were removed. Abdomen was closed without drainage. The convalescence was uneventful.

The patient returned for examination in six weeks. She had just completed a normal menstrual period which lasted three days and was not associated with pain. Vaginal examination at this time revealed the uterus in its usual ante flexion except that it was nearer the left side of the pelvis than normal. No induration or tenderness was present.

The old blood collected from the pouch of Douglas was centrifuged, smears were made from the sediment and stained. Microscopic examination did not reveal any evidence of definite endometrial tissue although there were many clumps of cell debris that might have been remains of epithelial and stromal cells.

Smears were made from the more fluid blood still contained in the uterine cavity. Definite shreds of endometrial tissue were found in this sediment. The endometrium on the wall of the uterus was thin and apparently in the early interval.

Many sections were made through the areas of endometrial-like tissue from different portions of the pelvis, and a careful search was made for endometrial tissue but none was found.

The microphotograph is a typical area which was removed from the posterior wall of the uterus near the bottom of the culdesac. It is a highly vascularized zone of granulation tissue (c and d) separated from but attached to the normal uterine musculature (a) by a thin strip of hyalinized tissue (b).

We were rather surprised in not finding endometrial glands in any of the tissue removed because grossly it resembled endometrium exactly. Also we had all the conditions necessary according to the usual opinions for implantation or metaplasia of epithelial elements. This patient had menstruated regularly for two years and all of the menstrual flow from one uterus had been regurgitated into the pelvis. The constant irritation of this menstrual blood had produced a highly vascularized granulating surface for the reception of misplaced cells.

Cron and Gey³ have shown recently that endometrium cast off during the menstrual flow is viable and capable of growth in appropriate media. We had microscopically apparently viable endometrial shreds in the blood still retained in the uterus, which had undoubtedly been shed during the monthly period just completed. There was an open avenue for its escape into the abdominal cavity as shown by the blood dripping from the dilated tube at time of operation.

The further study of patients operated upon for these congenital atresias may clarify our opinions of the sequence of events necessary for metaplasia or transplantation of endometrial tissue.

REFERENCES

- (1) *Sampson, J. A.*: AM. J. OBST. & GYNEC. 4: 451, 1922; 12: 459, 1926. (2) *Jacobson, V. C.*: Arch. Path. and Lab. Med. 1: 169, 1926; Arch. Surg. 5: 281, 1922. (3) *Cron, R. S., and Gey, G.*: AM. J. OBST. & GYNEC. 13: 645, 1927.

FURTHER SIMPLIFICATION OF THE TUBAL INSUFFLATION TEST*†

BY ADOLPH JACOBY, M.D., NEW YORK, N. Y.

*(Assistant Professor of Gynecology, New York Post Graduate Medical School
and Hospital)*

THE apparatus at present used in the Rubin technic for tubal insufflation is too well known to require description. The modification which I described in 1923¹ replaced the tanks of carbon dioxide, with the attached gauges and volumeter, by a Janet-Frank syringe, and air was used for the test. The apparatus consisted of a Janet-Frank syringe connected by rubber tubing to a T-tube, from the other arms of which were connected by means of rubber tubing the manometer and the Keyes-Ultzman cannula respectively. This modification in careful hands gave very satisfactory results. As in any other procedure, the personal element in conducting the test was an ever present factor in its successful outcome. Care had to be taken to make sure that there was no leakage past the piston in the syringe; that the rubber tubing connections to the T-tube, syringe, cannula and manometer were air-tight, and also that there was no leakage past the cannula at the cervical os. With uncertainty as to any one of these factors the interpretation of the test was at times difficult.

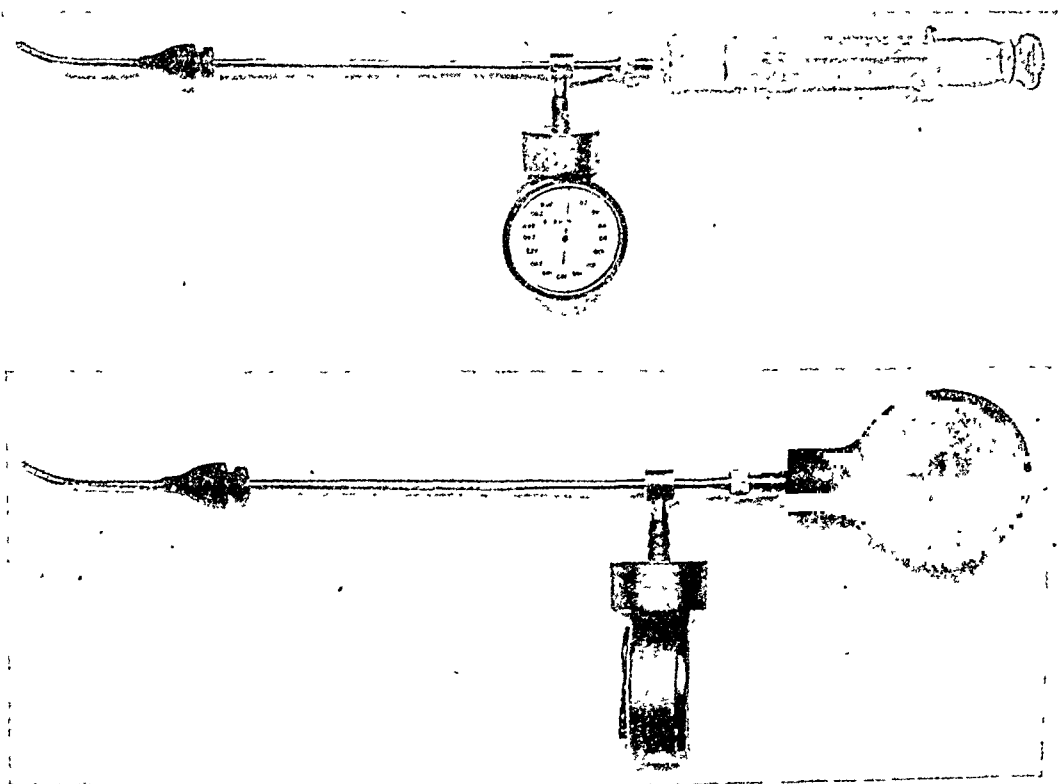
In order to make the test still simpler and to obviate all avoidable sources of error, I have devised this special cannula for the performance of the test. It consists of a narrow tube one-eighth of an inch in diameter, ten inches long and curved at one end like a uterine sound. At the curved end three holes are drilled from side to side in a space one-half inch from the tip. The other end is like the hub of a Luer needle. One inch from this end an outlet is tapped on the tube. This side outlet is threaded. To this side outlet is attached either a mercury manometer or a Tycos spring manometer. The threads are cut to permit the screwing of the Tycos directly to the cannula. A rubber acorn to act as an obturator is slipped over the curved end of the tube and placed about one and a half inches from the tip as usual. At the hub end a rubber bulb of 75 c.c. capacity, into which is inserted a special locking device, is attached. This locking device fits into the hub end and with a half turn is locked securely to the cannula. This joint is absolutely air-tight. One can readily see that with this arrangement all question of leakage at those points in the former modification, where it might occur, is eliminated. The apparatus being com-

*From the Department of Gynecology, New York Post Graduate Medical School and Hospital.

†Presented at the Academy of Medicine, Section of Obstetrics and Gynecology, May 22, 1928.

pact and when assembled in a single rigid unit, permits one to do the test without assistance. The whole apparatus except the manometer can be sterilized by boiling.

The test using this apparatus is performed as follows: With the patient in the dorsal position, a bivalve speculum is introduced and the cervix exposed. All mucus and secretion is wiped away. The cervix is sterilized by painting with iodine or mercurochrome. No tenaculum is placed on the cervix unless absolutely necessary to steady and fix the cervix. In the great majority of cases its use can be avoided. The instrument with the manometer screwed to the side outlet and the



rubber bulb locked at the other end, is gently introduced into the uterine cavity. Great care must be used not to traumatize the mucosa. After introduction the obturator is held tight against the external os by steady and firm pressure. The rubber bulb is slowly, gently and steadily squeezed forcing the air through the cannula, while the operator watches the pressure on the manometer. A suitable syringe can of course be used instead of the bulb.

In the patent cases the manometer reading will drop after reaching 100 mm. or over, and the air will continue into the peritoneal cavity through the tubes at the reduced pressure. In nonpatent cases the pressure will rise to 200 mm. or over, no fall takes place, and no air can be squeezed into the peritoneal cavity. In the patent cases the patient will complain of shoulder pains on arising or soon thereafter.

These pains are definite and pronounced and with air last longer than with carbon dioxide. Leakage from the instrument having been eliminated, the evidence of a falling manometer plus the entrance of air, plus the subsequent evidence of pneumoperitoneum, is conclusive of the patency of the genital tract. Fluoroscopy or x-ray is unnecessary.

The usefulness of any diagnostic procedure depends largely on its freedom from complicated apparatus or technic. Rubin's insufflation method for determining the patency of the genital tract, being the most valuable advance in diagnostic procedure in gynecology introduced in the last decade, should have wider application in suitably selected cases. This can be accomplished by simplification of the apparatus and technic, such as is possible with the present instrument.

REFERENCE

(1) *Jacoby, Adolph*: Modification of Rubin technique for transuterine inflation of fallopian tubes, *Surg. Gynec. Obst.* 36: 571, April, 1923.

151 WEST SEVENTY-SEVENTH STREET.

AN IMPROVED ANAL SHIELD

BY LLOYD A. CAMPBELL, M.D., SAGINAW, MICH.

THE anus has long been recognized as a source of contamination in perineal and vaginal repair work. It is with this in view that many operators cover the anal orifice with a sterile towel or pad stretched horizontally across the perineum, held in place by towel clips or safety pins. A covering of such permeability does not preserve asepsis and the mobility of a towel or pad after contact with the anus would only enlarge the infected area.

To overcome the above objections I have devised an anal shield made of metal and so shaped that all instruments and ligatures are kept within a sterile field during the entire operative procedure.

The shield comprises two principal parts, the trough and the two wings. The trough has its upper end (part proximal to patient) rounded and of such shape as to permit the greatest freedom of access to the operative field. At this part of the instrument contact with the patient is by a small flanged lip which bears against the skin at right angles and indents the surface, thereby making close fluid proof contact, and effectually protecting the operative field from contamination from below. The lower extremity of the trough is formed with a downward flare so that liquids or feces that run down the under surface cannot come into contact with any instruments resting within. The wings and the upper portion of the trough form an angle with the body of the shield which projects downward and away from the patient. This tends to avoid contact with the anus and also supplies a sterile tray

upon which clamps or ligatures may rest. The wings vary in size and form in order to be adaptable to the different types of patients. In thin patients a greater depth is required, in fleshy patients a lesser depth is necessary. This difference of contour requires three models. Beneath the tip of each wing is placed a hook of sufficient length to securely hold the shield in place during any operative procedure. This type of fastening affords ease of application and removal and allows the shield to be readily placed at any angle as the nature of the operation may re-

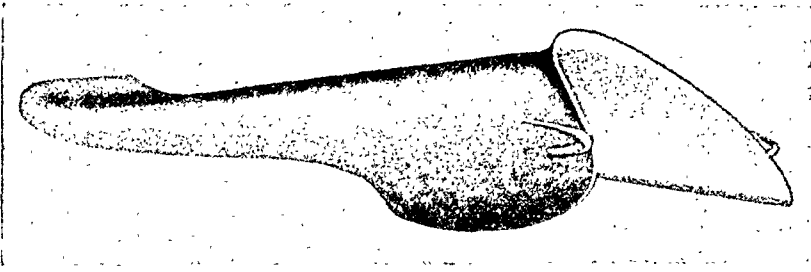


Fig. 1.

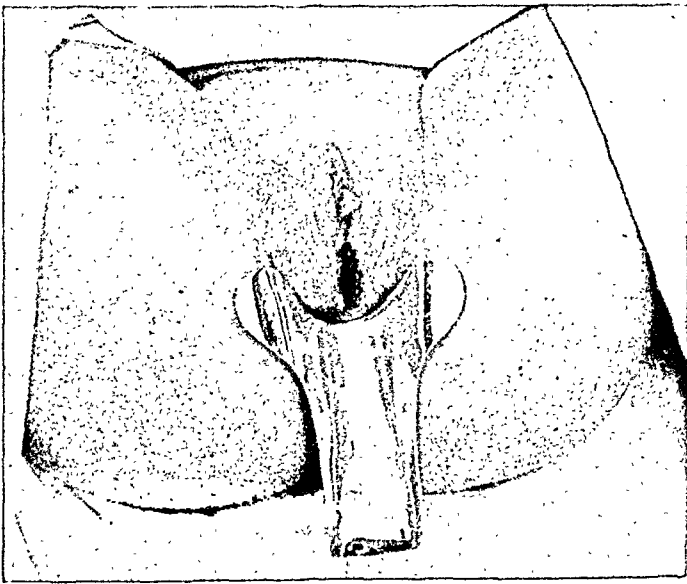


Fig. 2.

quire. The fastening device also prevents ligatures and instruments from slipping behind the wings into contaminated areas.

The shield is applied after the usual cleansing of the perineum; the buttocks of the patient resting slightly beyond the edge of the table in order that the lower border of the shield may be free. This allows the overhung weight of the trough and the instruments resting within to act as a lever, thus pressing the lip margins of the shield into closer contact with the patient. Each hook should be firmly inserted beginning at a point about the length of the hook above the selected resting place of the shield. The instrument is then allowed to hang in place

and should fit closely if the proper model is chosen. It has been suggested that the hooks also be used as retractors by inserting them in that manner.

The instrument has the following advantages:

1. It affords a sterile field in perineal, vaginal and vulvar operations.
2. It does not become displaced during operative procedure.
3. It is easily applied or removed.
4. It may be used in various positions.
5. It is readily sterilized.
6. It is used without danger to the patient.

GRAEBNER BUILDING.

A NEW OBSTETRIC BED

BY A. C. WILLIAMSON, M.A., F.A.C.S., PITTSBURGH, PA.

(From the Western Pennsylvania Hospital)

THE obstetric bed here presented considers the needs of the patient, physician, and nurse. The imperative requirement of such a bed is comfort to the patient plus ease and efficiency in handling for any necessary manipulation incident to delivery. The bed is of normal hospital size and material, built of standard stock, and adequately braced. Simplicity has been the thought in mind, and there are no unnecessary attachments requiring particular attention.

The main feature of the bed is the rolling down of the complete bunk, with the mattress attached, escalator fashion. In place of a spring, a foundation is used of hardwood slats, the upper half 5 inches and the lower $1\frac{1}{2}$ inches. These are fastened on an endless chain running through the center and sliding over a rigid foundation. Wood is used in place of metal because of rigidity and ease in keeping clean. The whole is turned by a shaft (*A*) running across at the foot and head of the bed. This shaft is geared at a ratio of 4:1. The handle is applied at point *B* to bring the patient to the foot of the bed and *A* to return mattress and patient to original position. A winged set screw *C* holds the sliding table firmly at any position desired. The mattress is articulated at the center and the lower half segmented in five portions. The whole mattress is snapped on the sliding table with a loop strap to guide it as it moves downward. The stirrups or leg holders with a wide angle fitting directly into the bed posts avoid the use of extra bracket holders. The width of the stirrups is easily regulated by the rotation in the bed post. In place of a shoe or similar device the ordinary loop strap is employed to hold the feet because of simplicity and efficiency. On the sides of the bed rather than using hand rail or metal handle, experience has forced us to use the ordinary tape sewed to metal rings. The average patient we have found will work well with such a strap. It can be loosely looped over the wrist hence the patient does not lose the strap between pains. In the upper posts of the bed there is an extension rod and hook which may be raised to any height desired for use with enteroclysis, pectoroclysis, or intravenous medications. A convenient shelf with a railing is swung under the upper right end of the bed to carry anesthetist's supplies. A simple elevating device *D* positive in action and employing the same handle as in moving the bed, at the foot, allows for immediate emergency use in shock or hemor-

rhage. There is a bracket on the two foot posts to which a flat shelf may be attached if desired for use during delivery. Large rollers at the head of the bed make its occasional moving easy, at the foot the ordinary flat plug for stability is employed. The bed is simple and rigid with no parts to get out of order and is easy to keep clean.

The bed is wide enough and sufficiently rigid to employ as an ordinary delivery bed. The mattress is sufficiently thick that a patient may remain on it for some hours without particular discomfort. Instead of pulling and hauling a partially anesthetized or struggling patient to the foot of the bed, all that is necessary is to have her buttocks at or below the center of the mattress, she may then be

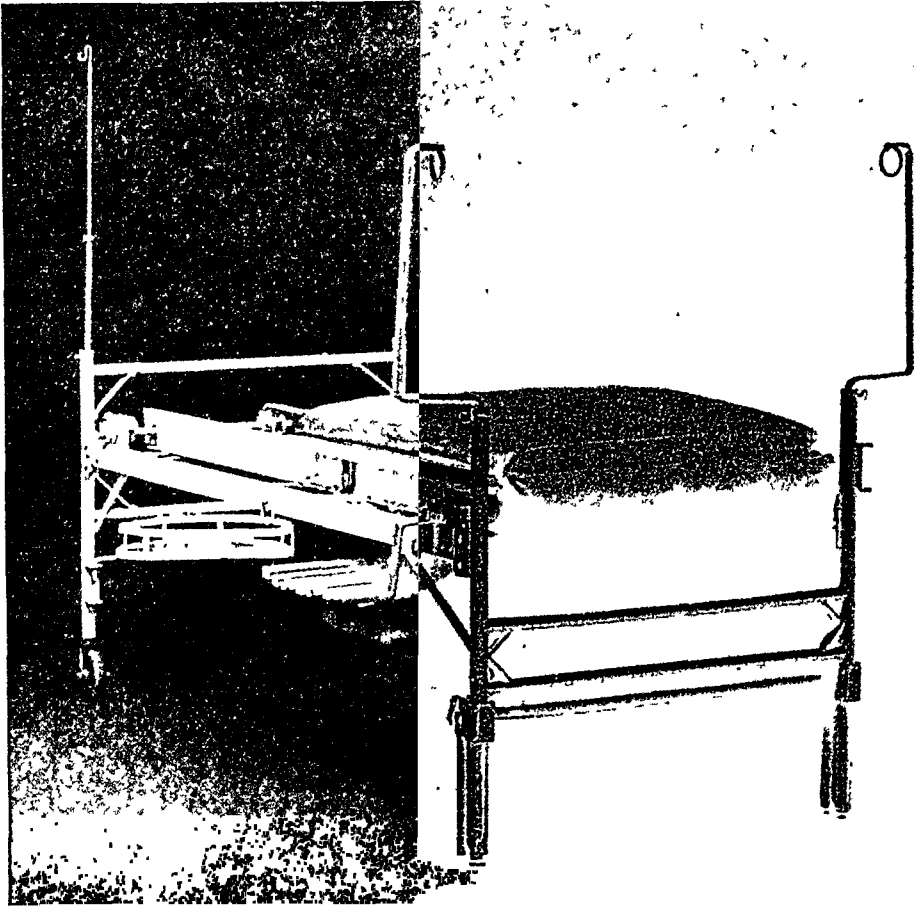


Fig. 1.

anesthetized and any nurse using the crank at the foot of the bed, may bring the patient easily down for stirrups and delivery. Should the patient move during anesthesia and get out of position, a partial turn of the crank will at once bring the patient to a convenient operating position. At the conclusion of the operation the bed is returned to original position by the use of the crank at the head of the bed. In our experience we have found it easier to handle patients, particularly heavy ones, and it has relieved our nurses of the heavy dragging and lifting usually incident to a delivery. For the operator the patient is more easily gotten into position and a winged nut at the head of the bed keeps the whole sufficiently rigid for manipulation. The height of the bed may be regulated to suit the operator either by the permanent application in the post of the bed or by a temporary use of the elevating device.

After six months use of the bed we find that we can handle the heaviest patient with comparative ease. The nurse instead of heavy lifting and tugging may get the patient into operating position with little effort and without the aid of the patient herself. The patient may be anesthetized in prone position and then

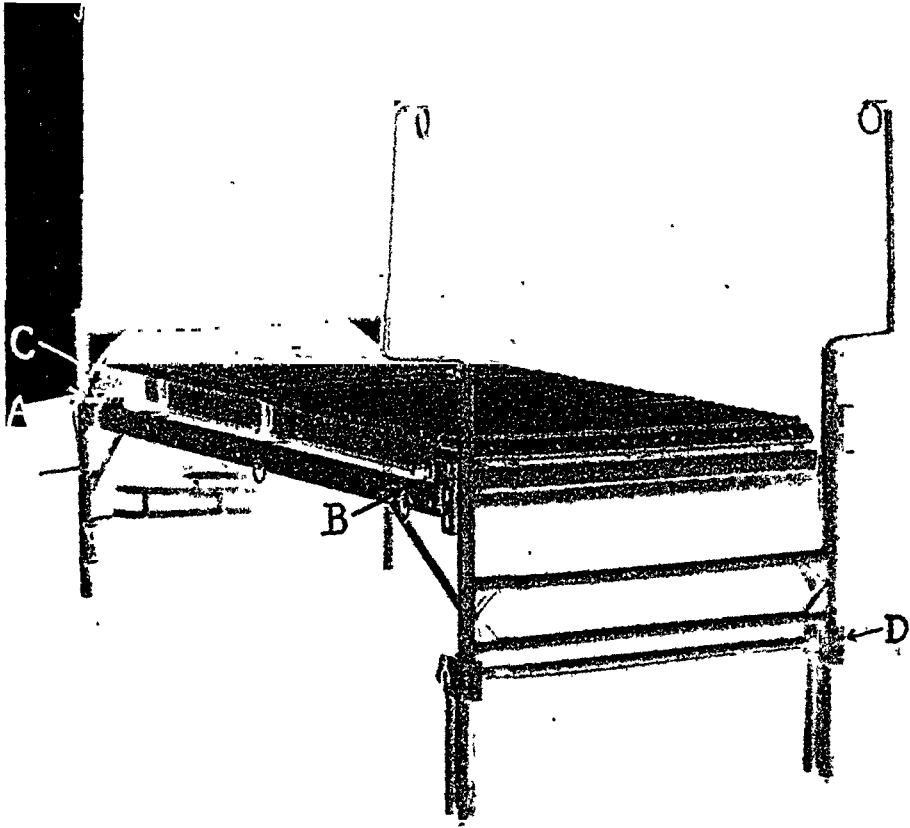


Fig. 2.

brought down and placed in stirrups. The sturdiness and simplicity with resulting ease in manipulation and keeping clean have appealed to our nurses.

The bed is manufactured by the A. J. Logan Co. of Pittsburgh. I am particularly indebted to Mr. Schifeier and Mr. Sell of that company for their patience and mechanical skill in working out the bed from the ideas suggested.

805 HIGHLAND BUILDING.

Society Transactions

PHILADELPHIA OBSTETRICAL SOCIETY

STATED MEETING, MAY 3, 1928

DR. HARRY A. DUNCAN reported a case of **Combined Intra- and Extra-uterine Pregnancy Advanced to the Sixth Month.**

On March 1, 1927, Mrs. B. L., aged thirty-three years, was admitted to the Samaritan Hospital complaining of pain and a very tender mass in the abdomen, backache, headache, and blood tinged vaginal discharge. Temperature 102°, pulse 102, and respiration 24. On the night of her admission she suffered a severe chill, temperature rising to 104°.

She stated that she has not been well since August, 1926, when she had her last menstruation. In September, she first noticed a mass in the abdomen, which has been growing larger. Two weeks ago (February 14, 1927), and six months after her menses ceased, she gave birth to a living premature child. This child lived but a few hours.

She has been pregnant five times; two living children.

Five years ago, in a North Carolina hospital, she underwent an operation for sterilization, at which time the appendix was removed and the uterus suspended.

A physical examination showed: teeth, poor; heart enlarged to left and presenting a mitral systolic murmur; abdomen, a large mass shaped like a fetus. The mass extended from the left costal margin to Poupart's ligament on the left, and one inch to the right of the midline. The mass was smooth and hard, over it tense rigidity and exquisite tenderness. A large uterus and the mass seem continuous. A venous hum was heard over the mass and uterus.

Bimanual examination revealed relaxed perineum and vaginal walls, cervix purple and flabby and readily admits two fingers. The uterus was the size of a two months' pregnant uterus. The fundus pressed upon the bladder. A large tender mass filled the left pelvis.

A tentative diagnosis was made of abdominal pregnancy and dead fetus or ovarian cyst with twisted pedicle.

The laboratory reported albumin and casts in the urine. Wassermann negative. Hemoglobin 36 per cent, R.B.C. 2,330,000, W.B.C. 38,500.

On March 4, at operation, a suprapubic median incision extending 2 inches about the umbilicus, was made.

Dense adhesions between the mass and omentum, intestines, anterior and posterior peritoneum were separated. The left tube and broad ligament were ligated close to the large uterus.

The mass was bluish black and fluctuated. It was still impossible to determine its exact nature. Because of its suspected septic contents, it seemed best to remove it intact. After some difficulty and the tearing of a hole in a large iliac vein, this was accomplished. No definite structures in the mass could be identified, but after its removal, a large raw surface with the large iliac vessels exposed, showed that it must contain the left tube and ovary, and the left broad ligament. The descending colon and sigmoid had been pushed beyond the median line. The large bowel was used to cover the raw surface.

The uterus was the size of a three months' pregnancy, the right tube and ovary adherent to the posterior surface of the right broad ligament. The gall bladder normal.

After pouring 1000 c.c. of warm saline into the peritoneal cavity, the incision was closed tight. Convalescence was better than we had expected, but because of persistent anemia and some temperature, eleven days after operation, she was given 350 c.c. whole blood by transfusion. The wound healed by first intention and she was discharged from the hospital to go to her home in a neighboring state thirty days after the operation.

The pathologist's report says, "When the mass was opened, about one pint of foul-smelling purulent material escaped. It measured 30 cm. by 30 cm. by 15 cm. The child shows beginning maceration. Section of the wall shows nothing characteristic of either tube or ovary. There is an area of necrosis toward the center of the sac, and a surrounding layer of polyps. Diagnosis: ectopic pregnancy with inflammation."

The family physician in a recent note, says he saw the patient three or four months after operation, at which time she looked rather pale and said "she was not very strong, but said she was gaining her strength slowly." He states that there was no history of twins in either family.

DISCUSSION

DR. GEORGE W. OUTERBRIDGE said he had a somewhat similar case a few years ago. He was called to see a woman in shock and collapse, due, he thought to a ruptured tubal pregnancy. On examination, the uterus was found to correspond in every respect to a two or three months' pregnancy, and on the left side was a large, soft, exceedingly tender, boggy mass, which strongly suggested the possibility of ectopic. At operation a typical left tubal ruptured pregnancy was found with much blood in the peritoneal cavity. The uterus was the size of a three months' pregnancy. The woman six months later gave birth to a normal child.

DR. LEONARD AVERETT had a similar case that came under his care one and a half years ago. She had not menstruated for ten weeks and presented herself at his office complaining of severe pains in the left lower abdomen, intermittent character, at times necessitating her going to bed.

Upon examination, the uterus was enlarged commensurate with her period of amenorrhea and in the region of the left adnexa a globular firm mass, very tender, was palpable.

A diagnosis of dermoid cyst of left ovary complicating early pregnancy was made. At operation he found the uterus pregnant and a left ectopic pregnancy, the tube having ruptured on its inferior surface, the blood accumulated and was circumscribed between the layers of the broad ligament. He removed the tube and ovary. She made an uneventful recovery and was discharged in two weeks and aborted at home a month later.

DR. FRANKLIN L. PAYNE (by invitation) read a paper entitled **The Treatment of Leucorrhea.** (For original paper see page 841.)

DISCUSSION

DR. EDWARD A. SCHUMANN said that when leucorrhea is treated by a well-done Sturmdorf operation, a continuance of the leucorrhea is not cervical in origin because the Sturmdorf operation completely removes the glandular tissue of the cervix wherein the leucorrhea originates.

Dr. Schumann believed that many patients have been over-cauterized. Rarely is it necessary in a cautery repair to anesthetize the patient or to hospitalize her,

or cause her to suffer any discomfort whatever. The nasal tip which has been so widely used in recent years in two, three, or four office sittings will usually secure the desired results without any discomfort at all, and he hesitated to use cautery as far as the internal os. A cauterization of such intensity destroying the tissue not only in the track of the cautery, but radiating its heat away from the hot knife will cause considerable degree of cervical stenosis, leaving a pocket at the internal os where mucoid material may reaccumulate.

DR. FRANK BENTON BLOCK and DR. FLOYD E. KEENE presented a paper entitled **The Treatment of Uterine Fibromyomas**. (For original paper see page 848.)

DISCUSSION

DR. GEORGE GELLHORN, of St. Louis, Mo., said that this exposition gives an excellent picture of the thoroughness of the work carried out in Clark's Clinic, and it represents such sound principles that one can safely subscribe to practically all of the points. About five or six years ago Dr. Gellhorn published his views on the question on when to operate and when to use radium in myoma of the uterus, which coincided rather closely with those expressed tonight. Like Dr. Block he put the forty year limit as the dividing time between operation and radiation. Of course, this must not be taken too literally. Radiation may, in some cases, be preferable in patients younger than forty, and on the other hand operation will be indicated in some women beyond that age, particularly if complications exist. Dr. Gellhorn agreed with Dr. Block that one should operate even if there is only a suspicion of possible complications.

It happens not infrequently that general practitioners, on finding an enlargement of the uterus, refer the patient to the radiologist for radium or x-ray treatment. It would be better if no patient were subjected to radiation therapy without a previous examination by a gynecologic expert. Where there is even the slightest doubt as to the diagnosis of a fibroid, operation is obviously preferable to radium.

In younger women enucleation of fibroids should have preference wherever it is technically possible. Whether to perform a total or subtotal hysterectomy, Dr. Gellhorn felt that in simple fibroids of nulliparous women a supravaginal amputation may suffice. In most other cases, however, there are complications on the part of the ovaries, intestinal adhesions or pathologic conditions of the cervix, and in all such cases he preferred the complete removal of the uterus because the wound field can be drained better and peritonealized more satisfactorily than in a subtotal hysterectomy. Unless the ovaries are quite normal and free from adhesions, he removed them with the uterus, and surely in all patients near the menopause, so as to forestall any complications from that source. We must remember that there is a close connection, as yet imperfectly understood, between fibroids and ovarian pathology, and that even after the removal of the fibromatous uterus the ovaries exhibit a tendency toward cystic degeneration. At best, they cease functioning within a year.

The symptoms of artificial menopause are very distressing, but with the newer ovarian extracts such as obtained according to the method of Allen and Doisy, they can be held in check satisfactorily and the patient tided over the critical period of one or two years after operation.

DR. JAMES L. RICHARDS presented the results of an investigation made of the myoma cases at Jefferson Hospital.

This study includes 196 cases up to December 31, 1926. They adopted the plan of keeping one year behind in order to obtain a better follow-up record. Of 196

cases, 126 (64 per cent) were treated surgically; 44 (22 per cent) by radiation; 10 (5 per cent) by radium and surgery; and 16 (8 per cent) received no treatment. Supravaginal hysteromyomectomy was the plan of surgical treatment in 110 (87 per cent) cases. Complete hysteromyomectomy, 1 (.07 per cent). Vaginal myomectomy, 8 (6 per cent); abdominal myomectomy, 7 (5 per cent). Concomitant adnexal disease required removal of both ovaries in 67 (53 per cent) cases. One ovary was conserved in 35 (27 per cent) cases. Both ovaries were conserved in 16 (11 per cent) cases.

As regards operative mortality, they did not divide the cases into complicated and uncomplicated, as Dr. Block has done. Of the 126 cases treated surgically, there were 5 deaths: three from peritonitis, one from shock, and one from collapse of lung, with parenchymatous degeneration of the liver, giving a surgical mortality of 3.96 per cent. There was no radium mortality.

Eighty-three of the surgical cases have been examined or heard from in reply to questionnaires. Eighty-one of these patients are cured, one patient has a small painful adnexal mass, and one developed carcinoma of the cervical stump one year after operation.

Forty-four, or all of the patients who received radiation have been examined or heard from in reply to questionnaires. Of these cases, 37 are symptom-free, a late radium cure of 84 per cent; four have a recurrence of bleeding.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF OCTOBER 5, 1928

DR. DAVID KUPERSTEIN (by invitation) read a paper entitled **Puerperal Morbidity at the Greenpoint Hospital**. (For original article see page 865.)

DISCUSSION

DR. ELIOT BISHOP commented on the favorable character of these figures, especially as this hospital has an ambulance service and there are a great many patients brought in who have been mishandled and have not had proper antepartum care.

DR. C. A. GORDON pointed out that in the presentation of these figures he held no brief for tincture of iodine. It is quite possible that this is of no value in the preparation of the cases and that we might do at least as well without it. We might do a little better with mercurochrome, and it is possible we might do even better with some other antiseptic if we knew of one.

In handling the large number of cases that come to this hospital, Dr. Gordon said they depended more upon noninterference, nonmanipulation, keeping away from vaginal examinations and conservative obstetrics than upon the use of tincture of iodine and that the iodine has nothing whatsoever to do with the low morbidity percentage that is shown here. In this service they constantly held out against the vaginal use of antiseptics, because they were not at all convinced that antiseptics is any better than asepsis in the vagina, and, personally, he believed that asepsis is much better.

In so far as morbidity is concerned, given a patient who has had a baby, we must always consider that she has had some kind of a wound or an abrasion somewhere along the birth canal. Puerperal infections are wound infections, and the question whether you should use mercurochrome or not is a small point. The main point is whether we should use anything at all or depend upon the natural resistance of the woman herself and upon the local conditions in the vagina.

DR. SAMUEL A. WOLFE presented a case report entitled **Chorioadenoma and Choriocarcinoma of Uterus**. (For original article see page 826.)

DISCUSSION

DR. O. A. GORDON, JR. said that we are very likely to be misled as to the frequency of hydatidiform mole; it is far more frequent than is usually supposed. The fact that Greenpoint and St. Catherine's Hospitals out of 15,000 deliveries have noted but 14 cases has very little bearing on the frequency of hydatidiform mole, because most of the cases reported were from three months' pregnancies or earlier. It has been very well demonstrated that if all the products of conception in an abortion are carefully examined under water, it will be found that there are a large number of cases of this condition in the early stages of pregnancy which on casual examination escape entirely. It has been pointed out by many that even microscopic areas of hydatidiform mole are just as great an etiologic factor in the production of choriocarcinoma as a mole the size of a five months' gestation. It is natural that most cases of hydatidiform mole escape attention because they are the type of cases that result in early abortion. They occur at homes, and nobody notices the products of the abortion, and naturally they escape entirely.

In regard to the relative infrequency of chorioepithelioma, it can safely be said that choriocarcinomas would be noted at Bellevue if they were at all frequent. Out of 3,000 autopsies at Bellevue Hospital by Dr. Simmers, he discovered only one choriocarcinoma, and that case occurred in the past year. They are the type of case with signs of pulmonary metastasis and distant metastases that the other and more elite hospitals do not care to take in.

As to the diagnosis, it is pretty well agreed that curettage in relation to diagnosis and prognosis is useless. It is the gross examination that is of far greater value; that is to say, the penetrating tumor tissue from curettage is likely not to show anything in the hydatidiform mole, even though the case may later develop chorioepithelioma. Therefore, cases of hydatidiform mole resulting in termination of pregnancy need not be operated by curettage in an effort to establish a diagnosis of chorioepithelioma, because that is generally considered of very little value. All this tends to establish the conservative treatment of hydatidiform mole, which Dr. Abbene's case report also establishes. They had so many thousand pregnancies and only one case of choriocarcinoma. Therefore, to argue that these hydatidiform moles occurring in women of 40 years or more should be followed by hysterectomy, seems to be rather radical treatment for a condition which usually is benign.

A type of treatment which is applicable to these cases and which has come up recently is radiation. When choriocarcinoma does develop in these cases, it is an embryonal tissue growth; therefore, it is very susceptible to radiation, either by radium or deep x-ray therapy. A moderate amount of radiation might be applied to the case without the danger to the woman which is associated with radical operation.

BROOKLYN GYNECOLOGICAL SOCIETY

MEETING OF NOVEMBER 2, 1928

DR. FREDERICK C. IRVING, of Boston, read, by invitation, a paper on the **Removal of Blood Plasma and the Reinfusion of Corpuscles in the Treatment of Convulsive Toxemia of Pregnancy.** (For original article see page 767.)

DISCUSSION

DR. JOHN O. POLAK said he was in entire accord with Dr. Irving that the treatment of eclampsia is *essentially medical*, and the oftener this statement is repeated to the profession the more benefit will accrue to the individual patient.

There is no question as to the value of venesection in eclampsia. At the Long Island College Hospital it has been used for years, and the last series of cases which is the best, has justified its continuance.

The objection that we take from the patient something necessary to life, namely the oxygen carrying bodies, is admitted. On the other hand, Dr. Polak referred to the successful employment many years ago of oxygen as a substitute for chloroform during the convulsions. This impressed him with the necessity of having the oxygen carrying bodies retained in the blood.

Another point of interest is the fact that the chemistry in eclamptic patients is, as a rule, relatively negative, yet in the cases associated with marked edema after the patient is delivered and the edema begins to subside, the blood begins to show changes in the chemistry. This bears out the point which Dr. Irving has mentioned, that the toxin is carried in the plasma, and not in the cell, because edema is something which we look upon as salutary; it takes the toxic plasma out of the circulation and places it in the tissues. Then, when the tissues are drained of the serum we find the toxin reappearing in the blood. This is confirmed by all blood studies that have been made in these cases.

The method is a very ingenious one. Dr. Polak said that for a number of years he tried blood letting in large quantities, removing from 800 to 1000 c.c. and reinfusing these patients with saline. Many of those patients recovered. Now the blood is taken and the patient reinfused with glucose solution, and more recover.

Dr. Polak was rather surprised that in Boston they are still using chloroform in eclampsia. He had believed that chloroform in the toxemias of pregnancy was past history—after the work done at Sloane, under the direction of the late Dr. Cragin.

Another very important fact in this study is the predominance of the sturdy Irish in Boston. This sometimes has an effect on eclampsia; at least in this vicinity Irish patients many times improve and handle eclampsia better than some of our other foreign born patients.

DR. IRVING (closing) said he wanted to apologize for the use of chloroform. That is not a Boston habit. That is confined to the Lying-In Hospital. Experimentally it has been proved that given over long periods of time chloroform produces damage to the liver. He used it in the way it is used by Stroganoff. There have been many improvements on his method and so many improvements on everybody's method, that he thought he would try to start an innovation by doing the thing in exactly the way the man who advocated it did.

In answer to Dr. Feinblatt's reference to exsanguination transfusion, that suggested itself, but he was impelled not to do it from methods of economy. This method costs the patient nothing, she gets her own cells back again. With donors, the cost of two plasmaphereses, at the current rate for the professional donor would be \$200.00 for two liters of blood. The hospital is not in a position to spend that amount.

The method is not complicated at all. It takes about an hour and fifteen minutes. The first ones took longer. The patient is bled in one of the case-rooms and in an adjoining case-room next door to her is the large centrifuge mounted on wheels, which is the only expensive piece of equipment.

Items

Obstetrical and Gynecological Society of Baltimore

The inaugural meeting of this recently organized Society was held on the evening of May 18, 1929, at which papers were read by Dr. Arthur H. Curtis of Chicago, Ill., and Dr. B. P. Watson of New York City.

The transactions of the Society will appear regularly in this Journal. The officers for the ensuing year are as follows: *President*, Dr. Emil Novak; *Vice-President*, Dr. John G. Murray; *Secretary-Treasurer*, Dr. Richard W. TeLinde.

American Gynecological Society

At the annual meeting of this organization, held at Old Point Comfort, Va., May 22, 1929, the following officers were elected for the ensuing year: *President*, Dr. Charles C. Norris; *First Vice-President*, Dr. Joseph B. DeLee; *Second Vice-President*, Dr. Frederick C. Holden; *Treasurer*, Dr. Fred L. Adair; *Secretary*, Dr. Floyd E. Keene. For member of the Council for four years, Dr. C. Jeff Miller; for members of the Council for one year, Dr. Guy L. Hunner and Dr. James C. Masson.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Collective Review

A Review of the Gynecologic Literature of 1928

BY SYDNEY S. SCHOCHET, M.D., F.A.C.S., CHICAGO

(*Adjunct Gynecologist, Michael Reese Hospital; Associate Professor in Gynecology, Post Graduate Medical School*)

INTRODUCTION

THE year 1928 marks real advance in gynecology. There prevails a pronounced investigative spirit in regard to the physiologic functions of the reproductive organs and to a correlation of symptoms and pathologic processes. Pelvic engineering, mechanical performance of operations, and other mechanical means of therapy are not glorified as in previous years. Such procedures are important in the field of gynecology, but knowledge of the physiologic processes of the reproductive organs in man is at least equally essential. We are embarked on a broader conception of the underlying biologic processes that go on normally in the pelvic structures, and their intimate relationship with other organs of the body. Gynecologists of today are specialists in the diseases of women. They are blazing a trail through an untrodden wilderness. We do not belong to that group of specialists who "know more and more about less and less." Let me repeat with the evangelic fervor of Faure, "One must know" to have the right to perform pelvic surgery, to have the right to attempt an act which may carry with it life or invalidism or even death of one's fellows.

Biologic research and its application to physiologic functions of the reproductive organs represent the outstanding topics in gynecologic literature of 1928.

GENERAL PROBLEMS

There is a great tendency among gynecologists to accept new laboratory procedures with an enthusiasm that subsequent experience and critical deliberations have shown to be unwarranted. Also the writer¹ of this review appreciates keenly the remarkable contributions that the laboratory and its workers have made toward successful practice of medicine and diagnosis; yet it should be remembered that hospital routine though often overdone as well might be underdone.

The sedimentation test has a definite rôle in our diagnostic armamentarium if we enforce a sane attitude on its shortcomings. This test cannot be advocated as an indispensable means of gynecologic diagnosis, but its employment admittedly proves an aid for more accurate conclusions as to the nature and extent of the pathologic condition existing within the pelvis. Reel² finds that routine use of the sedimentation test in all gynecologic cases calls our attention in certain cases to the presence and degree of infection not otherwise suspected.

Minor variations from normal blood counts were observed by Hubbard and Geiger³ to produce quite marked differences in sedimentation rate. Frimodt-Møller and Benjamin⁴ in India noted that tropical climate influences the test and produces a higher rate of sedimentation than in the colder West. In diseases of the liver and gall bladder, Noah and Hahn⁵ found that in lesions of the hepatic parenchyma it is greatly decreased when associated with atrophy of that organ.

To overcome inherent difficulties in the methods now in common use, Plass and Rourk⁶ advocate the use of heparin as the anticoagulant. The results then express the percentage of total possible settling which can occur during the one hour period of observation as compared with the plasma volume percentage determined by centrifuging. Further studies of the many factors involved are required to clarify existing differences of opinion as to the value of the sedimentation test.

Gellhorn⁷ presents a very conservative analysis of diathermy in gynecology and rightly concludes that "the pleasing results should not, however, obscure the fact that the new method is only in its infancy, and that a great deal of further careful clinical observation is needed to establish the possibilities and limitations of this new approach. Just because heat of such intensity is a powerful curative agent, it is also capable of causing considerable harm, and it behooves gynecologists to use it cautiously and judiciously." This conservative attitude among gynecologists will prevent many absurdities and unfounded statements so frequently presented in literature.

With the continued increase in new procedures for diagnosis and treatment the gynecologist is brought forcibly and repeatedly in contact with the effects of the x-ray and radium on the germplasm of the ovum. Murphy⁸ in a very critical study and review analyzes the many phases of this field of investigation and justly concludes that irradiation of pregnant animals or human beings is a procedure extremely dangerous to the health of the offspring (61.3 per cent defective), and in the case of human beings should not be undertaken unless existing pregnancies are to be terminated prior to the period of viability of the child.

Robinson⁹ takes exception to views that roentgen-ray treatment is a dangerous and unwarranted therapeutic method. This fear is based upon the results of irradiation of frogs and toads. While this might be true for such animals, the pathologic changes in the higher forms of life certainly differ from those occurring in the frog. No stigmas of development were noted in direct progenies of irradiated mice nor in the offspring of those progenies of the first and second generations. Robinson's total experimental data consist of eight experiments, each made on one rabbit. This is an outstanding example of conclusions that might be disregarded by careful gynecologists. After all we may as well reason that there is a difference in cell reactions between the rabbit and the human.

Clarence Cook Little,¹⁰ one of our foremost geneticists, presents a very clear and exact analysis of the effects of agents modifying the germplasm. It has been conclusively shown that radioactive substances produce different degrees of injury, and that injured germ cells still can functionate. When using any of the many new innovations in x-ray diagnosis or therapy, we should always remember that any treatment of the gonad with radioactive substance, which causes death or

inactivity in some sex cells, might produce in other sex cells of the same individual only a malformation or internal cell upset.

In consideration of such careful studies and of such legitimate difference of opinions the gynecologist should adopt extreme caution, since he cannot deny the possibility of future recessive hereditary defects produced by irradiation.

A very interesting study on the effects of sexual activity in mice is reported by Slonaker.¹¹ The data shows that light breeders have the longest span of life; the life span of the moderate breeders was second longest and that of the heavy breeders still shorter. Virgins, however, showed the shortest life span. These studies¹² emphasize that in the process of reproduction the maternal organism gains as well as it loses.

Conventional views encountered among laity and medical men claim that puberty produces some activator and gives a special impetus to mental growth. In a careful study of two cases of precocious pubescence by Gesell¹³ it is clearly demonstrated that these traditional views are unfounded and that the nervous system manifests a high degree of autonomy in spite of adversity, malnutrition or abnormal sexual development. Yet it is to be noted, that not infrequently disorders of the female sexual function are of a mental origin.¹⁴

In that group of cases generally known as the acute abdomen early correct diagnosis is exceptional. Though it be impossible to make a positive diagnosis hasty opening of the abdomen is not to be advised with too light a heart. However, one is not to construe this statement that delay in the acute abdomen is suggested nor hesitation in recommending operation, after careful examination, one comes to the conclusion that there is within the abdomen a pathologic process amenable to surgical treatment.

Ovarian hemorrhage from a ruptured graafian follicle or corpus luteum is not infrequently diagnosed as acute appendicitis or ruptured ectopic gestation. Novak collected 40 cases, and Brakeley and Farr another 14 instances with a preoperative diagnosis of acute appendicitis. Wilson¹⁵ reports seven additional cases in which acute appendicitis was suspected. Wilson attributes this form of ovarian hemorrhage to an exaggeration of the normal physiologic mechanism of the rupture of the graafian follicle.

Mazer and Sobel¹⁶ suggest a relation of obscure abdominal pain and chronic arthritis to infections of the uterine cervix, an assumption not accepted by most gynecologists.

The close relations, embryologic and anatomic, between genital and urinary tracts not infrequently are responsible for simultaneous disease of both, and too often the signs and symptoms of disease in the one tract are misinterpreted as belonging to the other. Laws reported in 1926 that "More than 30 per cent of patients who come to a gynecologic service complain of urinary symptoms." Hunner¹⁷ states that many gynecic symptoms are due to a ureteric stricture, and that it is one of the most common lesions of the abdominopelvic cavity.

Empirical treatment based on the principle of protein therapy is less frequently employed in cases of pelvic infections. Levy-Solal and Louvel,¹⁸ however, employ pyotherapy for periuterine infections.

Inadequate preparation of the skin is the most probable cause of postoperative wound infections according to Sutton.¹⁹ Investigations have shown that the incidence of postoperative wound infection following preparation of the skin with iodine amounts to 12.8 per cent.

Too often the aftertreatment of pelvic and abdominal surgical cases is not followed by the surgeon, but delegated to junior assistants or associates on the case. Worrall²⁰ cites many disastrous results due to this division of labor, complications not recognized by the junior assistant.

As a result of the excellent teachings of Bloodgood concerning the value of a pathologic diagnosis at the time of operation many new methods and practical procedures have been proposed. Terry²¹ has perfected a very excellent method for preparing sections of fresh or fixed tissues for microscopic examination even of thick sections with a solution of neutralized polychrome methylene blue. This method offers certain advantages over the frozen section technic. It is a deplorable fact that the majority of operators still do not make routine microscopic examinations of all curettings. Ladin²² reports five cases in which the carcinomatous mass was completely removed by curettage. A failure to examine these sections would have led to a serious embarrassment in managing properly these cases.

Stein²³ has devised a new instrument for delivery of abdominal masses which obviates the necessity for a large incision in the abdominal wall. In general there is probably no serious objection to a large abdominal incision, nevertheless there is real merit to the procedure advocated by Stein.

Endocrine therapy has not produced the brilliant results so frequently vaunted by the new discoveries. However, in the past few years rapid strides have been made with endocrine products due to intensive and critical investigations of the physiologist, pharmacologist and chemist with specific tests. In recent years Frank²⁴ has been most instrumental in placing endocrine therapy in gynecology on a rational basis as the result of his studies on the female sex hormone.

There is justified reason for believing that the active principle of the ovary is destroyed by the alimentary juices, and that hypodermic administration is the method of choice. The active principle of the liquor folliculi is now marketed under trade names such as "Folliculin," "Oestrin," "Oestrogen," "Feminin," "Menformon," and "Thelykinin." It is generally agreed that lipoid solutions are the best. Novak²⁵ gives a very clear and concise exposition of the present status of ovarian therapy.

ANESTHESIA

A most instructive study of the effect of ethylene-oxygen anesthesia is reported by Brumbaugh.²⁶ Observations were made of the effect of this anesthesia on the normal human being in the absence of any complicating factors. It is not amiss to mention that eight of the fifteen volunteers for this experiment were graduate physicians. Among the salient facts deduced are that no change in hemoglobin, icterus index, urea content or the coagulation time of the blood was noticed. There is a marked increase in the blood sugar immediately following anesthesia, the average being 45.3 per cent, with a fall to practically normal level in the subsequent twenty-four hours.

In a series of experiments reported by Blalock²⁷ cardiac output and blood pressure were found not effected by the preliminary use of morphine. Gwathmey and Hooper²⁸ advocate the use of morphine sulphate and magnesium sulphate before the general anesthetic is ad-

ministered. Many gynecologists have found results to be better with morphine and scopolamine combined.

When a general anesthetic is contraindicated local or spinal anesthesia might be employed. It is obviously true that the ideal anesthesia is local anesthesia but the ideal local anesthetic has not as yet been found. Spinal anesthesia has a definite place in gynecic surgery. Schutz²⁹ reports only 57 failures in 2251 cases. Rapoport³⁰ had 26 failures in 500 cases or 5.2 per cent. He employed procaine tablet C as compared with apothesine of Schutz's series. Spinal anesthesia is warmly recommended by Sise³¹ as the anesthesia of choice for abdominal operations. It has also been advocated for treating the so-called spasmodic rigidity of the cervix during labor but Balard and Mahon³² failed to obtain satisfactory results in this condition.

One must not think that local or spinal anesthesia is free from fatalities. Martin³³ reports a death when only 15 c.c. of a 2 per cent procaine solution was injected. Bourde³⁴ saw a death from spinal, and Bressot many alarming symptoms with this form of anesthesia.

Rectal ether oil drop anesthesia is strongly advocated by Matti³⁶ but it should be borne in mind that we are deprived of a safe control of any anesthetic when administered by rectum, and lack of perfect control might mean death to the patient.

EXTERNAL GENITALIA

Davis and Cron³⁷ have devised a very ingenious and practical operation for congenital absence of the vagina. The labia minora and adjacent mucosa are utilized in the formation of an artificial vaginal canal. This type of operation offers the safest and most satisfactory solution provided that the external genitalia are well developed and the labia minora hypertrophied or at least of normal size. The Schubert or Baldwin operation must still be utilized in the presence of poorly developed labia. Köhler³⁸ reports excellent results for aplasia of the vagina with the Schubert operation.

The term double vagina is customarily though incorrectly applied to cases in which there remains a septum as the result of incomplete fusion of the two müllerian ducts. Siegler³⁹ describes an interesting case of this sort in which unfortunately only the blind vaginal canal had been employed in marital relations. Instruction as to the use of the other channel connected with the uterus resulted in a normal pregnancy.

Duplications of both the genital structures and the lower intestinal tract are extremely rare. Hinkle⁴⁰ describes a case of this type presenting a double urethra, vagina, and rectum.

Vaginal hernias have received but little attention in literature as this anomaly is often overlooked in routine gynecologic examinations. The surgical treatment requires a thorough knowledge of the pelvic structures. Masson and Simon⁴¹ present a very careful study of this condition and strongly advise against routine standardization of this operation.

The term vaginismus should be restricted to active, involuntary, local, sphincteric resistance at the ostium vaginae to penetration. If this reflex spasm is not idiopathic or due to lesions in and about the vaginal orifice, Reder⁴² proposes incision of some of the muscle fibers

directly implicated in the reflex spasm, and the enlarging of the vulval outlet. It is understood that vaginismus due to a hysterical anxiety neurosis cannot be benefited by surgical measures.

The surgical treatment of mixed tumors,⁴³ sarcomas⁴⁴ and carcinomas of the vagina and vulva, as a rule, gives poor results. With the diverse and extensive lymphatic drainage from these parts, extensive and mutilating operations followed by irradiation do not give any better end-results than intensive application of radium and x-rays. Shaw⁴⁵ classifies the "mixed tumors" in three groups but offers no new explanation of the origin of these neoplasms. As a rule, epitheliomas of the vagina occur in the third or fourth decade of life, and involve the posterior vaginal wall more frequently than the anterior wall. The initial symptoms are even more trivial than in carcinoma of the cervix. Goldberger⁴⁶ observed 27 cases of this sort during a period of eight years. During the same period there were seen 1,097 carcinomas of the cervix and 83 of the uterine body. Sarcoma of the vagina causes very few symptoms in the early stages except that sarcomas of the vagina ulcerate earlier than those in other parts of the body. Poor operative end-results are recorded by Bassett and Guerin.⁴⁷

Present teaching in gynecologic surgery in general does not favor vaginal drainage for intraabdominal operations. More complications were observed when this practice was in vogue. Baeten,⁴⁸ however, believes that in this type of case vaginal drainage is superior to that by the abdominal route. Babcock⁴⁹ favors the vaginal route even for the removal of ectopic pregnancy.

New classifications of results obtained with diathermy and other electrical treatment of endocervicitis appear in the literature of 1928. So-called objective and subjective cures are added to the many existing classifications. Heyman⁵⁰ reports the results of 117 cases, with objective cures of 40 per cent and subjective cures of 75 per cent. Masson and Parsons⁵¹ report excellent results with the cautery for cystic cervicitis. The writer of this review has observed a secondary pelvic involvement following a cauterization. The Post cautery causes too much damage about the mouth of the cervix and may lead to a definite stenosis. Dickinson⁵² rightly warns against these dangers and strongly advocates the use of the hot wire loop. Miller⁵³ summarizes his studies on the management of chronic endocervicitis and concludes that local treatment is very unsatisfactory and that diathermy gives only partially satisfactory results. Hyams⁵⁴ after trying diathermy in 30 cases reports that the clinical results are not satisfactory because it does not produce enough deep or wide sterilization to be effective.

The application of chemical dyes and antiseptics has not materially changed of late with the exception of a change in the color of the antiseptic solution. Eosin-mercury compounds, according to Statham⁵⁵ appear not to affect very markedly the gonococcus.

It seems like a serious measure to inject living bacteria into the organism to cure a chronic infection, however, injection of live gonococci is advocated by Wolff⁵⁶ for the treatment of chronic cases.

A rare condition of hydatid cyst of the culdesac of Douglas is recorded by Charrier and Gandy.⁵⁷

UTERUS

A most valuable addition to our information of the anatomy of the uterus is supplied by the studies of the cyclic changes in the human uterine glands reported by O'Leary and Culbertson.⁵⁸ Careful observations of the menstrual cycle seemingly show that the conception of a "regular twenty-eight day cycle" is rather erroneous. King has shown that the cycle of a given individual varies, although there exists a distinct type in the curve for all the menstrual cycles studied. Another important point is the fact that the various phases of the menstrual period are not found to correspond to the histologic changes in the uterus. Three outstanding facts are established in this paper, namely, the repair of the glandular part of the mucosa by a process of budding from the functional layer toward the surface; the early necrobiotic changes in the stroma, and the repair of the surface epithelium by migration of epithelial cells from the mouth of the glands.

From an experimental study of the reticulo-endothelial cells of the uterus of the rabbit by means of intravital dyes, Flukmann⁵⁹ concludes that macrophages are normally present in the uterus. In aseptic inflammation they are found at the site of the lesion. In pregnancy they are markedly increased in numbers. In the human uterus their occurrence under physiologic condition has not been determined, but macrophages are present in large numbers during pregnancy.

It is a well-known fact that the uterus can function independently of the central nervous system due to a peripheral nervous mechanism. The mode of ending of the nerve fibers (axones) within the muscle is unknown. From a study on excised uteri of rats and guinea pigs, Fleming⁶⁰ believes that there are three levels in the neuromuscular chain, namely, a proximal, intermediate and a peripheral level.

Unlike the urologists, gynecologists but rarely have to deal with a left-sided varicocele located in the broad ligament. A case of this sort is reported by Henze.⁶¹

Hernias of the uterus and tubes through the inguinal canal are usually associated with defective development of these organs. Sarnoff⁶² states that only 52 cases of inguinal hernia of the nongravid uterus and 14 cases of the gravid uterus have been reported in the literature.

Schubel and Teschendorf⁶³ have studied the action of drugs on the parturient uterus of the cat and rabbit, with the cavity of the uterus filled with iodized oils. Serial x-ray pictures of the contractions were taken. They claim that this method is superior to the customary study of the uterine strip. Experiments made by Chopra⁶⁴ et al. with quinine and quinidine indicate that the oxytocic action is more pronounced in the full-term pregnant uterus. No experimental evidence was obtained to show that quinidine in this action is more effective than quinine, or that it is as claimed, ten times stronger in its stimulating effect on the uterus.

Among the rare infections of the uterus is a case of multiple gummas of the uterus reported by Billig⁶⁵ and of diphtheritic endometritis described by LeFevre.⁶⁶ The diagnosis of syphilis was based on characteristic histopathologic findings rather than the demonstration of spirochetes.

Hobbs⁶⁷ suggests irrigation of the infected uterus with glycerin through a rubber catheter. This, to the reviewer, seems an objectionable and dangerous suggestion.

Simon⁶⁸ discusses the causes and characteristic symptoms of hemato-metra incidental to a report of 23 cases.

In a large percentage of cases of chorioepithelioma malignum there is a history of a preceding mole, and one might thus gain the impression that hydatidiform degeneration of the chorion very frequently leads to this malignant growth. Such a deduction is not justified since vesicular degeneration of the chorion certainly is not an infrequent occurrence. On the other hand, the fact that most cases of chorioepithelioma are somehow published, exaggerates our ideas of their frequency. They are comparatively rare. DeLee saw 16 cases, Giglio 13, and Kehrer 50 cases of hydatidiform mole which did not develop into chorioepithelioma. However, we never know which of these might later become malignant. Bland⁶⁹ does not believe that hydatidiform mole, potentially a malignant degeneration, is suited for a policy of mere watchful waiting. He reports ten cases, six of the patients developed a chorioepithelioma (four recovered and two died). Simple moles were present in four cases and of these two recovered and two died.

Matschan⁷⁰ reports a hydatid cyst of the broad ligament and states that this is the tenth reported case of isolated echinococcus of the broad ligament.

The frequency of sarcoma of the uterus requires a careful statistical study. Variations from 1 to 8 per cent of all fibroids are recorded in literature. Miller and Rogers⁷¹ find that 1.4 per cent of their series of fibroids were malignant (sarcoma).

MALPOSITIONS

In an editorial⁷² of the *Journal of American Medical Association* on the passing of the pessary, the claim is made that there presents itself only an occasional indication for "this little relic." A better understanding of the normal positions of the uterus, and of the causative factors that lead to displacements, undeniably permits the intelligent gynecologist to discard much of the old "displacement therapy."

In an analysis of displacements, Bonney⁷³ calls attention to the important rôle of the pubocervical fascia or "pelvic shelf" in keeping the uterus and vagina in position. Operations based on anatomic structures of the pelvic fascia rather than apparent supports of the uterus offer the best end-results. Goff⁷⁴ avails himself of this important fact in his operation for the damaged pelvic floor. Simple operations of plecting of the torn pubocervical fascia in cystoceles without prolapse gave Miller⁷⁵ the best results. That there are occasional instances when the obsolete may be employed to good advantage is illustrated in the article by Strongin⁷⁶ on the use of the pessary as a palliative measure in the correction of cystocele and retroversion in the childbearing period. However, we should not be too enthusiastic about the virtues of the pessary.

Fibrosis of the uterus is not usually attributed to its retroversion, although Cooke⁷⁷ believes that this is a fact. This conclusion simulates speculative reasoning. Another passing view is interference of circulation in retrodisplacements, described by Hadden.⁷⁸ The relative value of various operations for procidentia, prolapse, retroversion, and vesicovaginal fistulas is analyzed by Hertzler,⁷⁹ Magid,⁸¹ Barrows,⁸⁰ and Krinsky.⁸²

MENSTRUAL DISORDERS

Of late we have been in the habit of looking upon menstruation as a sequela of ovulation. This is apparently incorrect in the light of facts observed in lower animals. Corner,⁸³ in his epochal work on menstruation in the monkey (macacus), has produced very strong scientific evidence that the current theory of the human cycle is not essentially true for the monkey. These findings have also been confirmed by Hartman⁸⁴ and Allen.⁸⁵ The final solution of this problem will require careful observation of menstruating animals (monkeys) at their normal places of abode and a detailed study of the cytologic changes that occur during the menstrual cycle. Needless to say that furthermore pure active principles prepared from the ovary must be verified by physiologic and pharmacologic experiments.

During the past year Hartman⁸⁶ reports the gestation period in the monkey (macacus rhesus) to be six lunar months. This is the first exact observation on the length of gestation in a monkey, in fact in any primate other than man. Another important point in these observations was the apparent confirmation of the generally accepted view of gynecologists that the optimum period for conception (human) is about ten to fifteen days after the beginning of the menstrual flow.

A third important fact established in primates was the presence of the "placental sign" described by Long and Evans⁸⁷; that is when implantation has taken place in the rat, about fourteen days later the vagina contains microscopically demonstrable red blood cells. This sign was observed in primates, also on the fourteenth day, and apparently represents leakage from the placenta.

This phenomenon should be thoroughly investigated by obstetricians since it may give us a clew to the very early diagnosis of pregnancy in human beings.

In view of the warnings of the foremost geneticists concerning the harmful changes produced in germinal epithelium by radioactive substances, x-ray treatment of amenorrhea should be looked upon by gynecologists with grave concern. Kaplan⁸⁸ reports the treatment of 38 cases of amenorrhea (30 of these married and 8 single) in which bleeding followed this procedure. Kaplan does not think that ill effects will result to the patient or to her offspring.

What he really is advocating, in my belief, by this radical suggestion is that we should not worry until the human race is thoroughly seeded with defectives beyond the control of future generations.

Werner⁸⁹ propounds the hypothesis that increased viscosity of the blood results in an increased production of internal secretions of the posterior pituitary lobe. He reasons that this would control uterine hemorrhage. Large doses of diuretics (urea- were given to 43 patients suffering from excessive menstruation. Of these, 33 responded to the treatment within a few hours. Only cases of excessive bleeding of ovarian origin should be treated in this manner. Spiegler⁹⁰ determined the average potassium values of blood during the menstrual cycle and found that there was an increase during the premenstrual period and a considerable fall during the flow. Schmitz⁹¹ studied 2523 consecutive gynecologic cases in two institutions and found uterine hemorrhages mentioned in 42.7 per cent in one institution, and 28.07 per cent in the other. Of these cases, 51.04 per cent represented inflammatory lesions of uterus and tubes. Inflammatory lesions of the

ovaries gave the highest percentage of polymenorrhoeas, and malignant lesions of the uterus the largest number of metrorrhagias.

Nielson⁹² found functional hypertension a very common symptom of the menopause. A small percentage of menopausal hemorrhages are due to newgrowths of the ovary. Lahm⁹³ reports a case of this type in which uterine bleeding began nine years after the menopause. There was present regeneration of uterine mucosa in the manner of post-menstrual proliferation due to the influence of the ovarian parenchyma.

Bleeding from the uterus frequently occurs after pelvic operations in which the ovary is involved. However, there is no typical post-operative change in the menstrual cycle. Of 80 cases studied by Clauberg,⁹⁴ 75 per cent showed no postoperative effect in regard to regularity. Twenty per cent show a change in duration of flow and the amount of blood lost.

A case of postoperative menstrual fistula is reported by Ballin.⁹⁵

ENDOMETRIOSIS

It was due to the meritorious work of Sampson that renewed interest in endometriosis was aroused in recent years. In 1927, Schochet⁹⁶ reported a series of experimental studies of endometriosis in the rabbit and guinea pig. Bits of endometrium were transplanted into the anterior chamber of the eye. Fragments that were vascularized showed hyperplasia and evidence of marked growth. Traut⁹⁷ succeeded in growing human endometrial epithelium of the uterus in cultures but failed to observe atypical growth. Stroma cells showed the more active growth due to an apparent latent period of the epithelial cells. The addition of corpus luteum extract caused a very rapid growth of the stroma cells.

In a series of 45 experiments Allen and Bauer⁹⁸ repeated the work of Schochet with bits of endometrium transplants in the anterior chamber of the eye with 44 successful "takes." The customary recognition of previous experimental work is ignored by these authors.

Goldstine⁹⁹ is of the opinion that the majority of endometriomas are of inflammatory origin and that the mere presence of blood plus glands and stroma does not necessarily mean that they are of endometrial origin. Goldstine states that these endometrial transplants must undergo characteristic cyclic changes of the uterine mucosa before they can be accepted as of müllerian origin. Other investigators in this field of research have not recorded endometrial transplants in the tonsil as described by Goldstine, but have observed decidual reaction in endometrial implants in the pelvis and rectovaginal septum. There is much scientific evidence that the serosal theory of Robert Meyer is incorrect. Thirty cases of endometriosis were found by Shirer¹⁰⁰ in a series of 750 tubes and ovaries. Clinically the preoperative diagnosis was not made in a single instance. In contrast to radical extirpation, recurrence of symptoms was the rule when conservative operative measures were employed. An unusual case of diffuse pelvic endometrioma, in which the ureters were constricted, is reported by Morse and Perry.¹⁰¹

German¹⁰² states that 12 cases of endometriosis in the abdominal scar following cesarean section have been reported in the literature and adds two additional cases. He believes that the implantation theory offers the best explanation for the origin of this group of endometri-

omas. When we consider that cesarean section is in vogue at the present time it is remarkable that endometriosis does not occur more often. Douglas¹⁰³ suggests that this may be explained by the lower viability and the tendency toward decrease of growth in the endometrial cells during pregnancy as compared with the nonpregnant state. Allen¹⁰⁴ examined the tubes of 16 cases in which the abdominal operation was preceded by dilatation and curettage. Twelve cases revealed macroscopic blood in the tubes of which six cases showed the presence of débris and areas of definite epithelial cells. Allen concludes that operative procedures which increase intrauterine pressure may implant endometrium into the peritoneal cavity.

A very interesting case of surgical transplantation of endometrial tissue into the abdominal wall is recorded by Roeder.¹⁰⁵ This patient had a ventral fixation in which silk sutures were employed. At a second operation a tumor was removed which originated in the uterine cavity and followed along the suture line of the silk thread to the abdominal wall.

STERILITY

Meaker¹⁰⁶ calls attention to three noteworthy advances in the study of sterility during the past fifteen years, namely Hühner's postcoital examination; transuterine insufflation of gas and the injection of iodized oils; and third, the intensive study of endocrinology and metabolism. More than 40 possible causes of sterility¹⁰⁷ have been carefully studied and the treatment outlined. It is obvious that the routine pelvic examination and examination of the semen are not sufficient to determine all the possible causes of sterility. Well-organized sterility clinics, as outlined by Meaker, will play an important rôle in the future study of this problem.

Kurzrok and Miller¹⁰⁸ made a detailed study of the lytic action of semen on the cervical plug and present hypothetical evidence that the semen may act as an accelerator of oxidation (lytic substance) and the reducing system an inhibitor to the initial cytolysis. Studies on the agglutination of cells with the body fluids and their relation to the sterility problem are reported by Uchigaki.¹⁰⁹ Calcium is an important factor in these problems. Loew¹¹⁰ finds that calcium sodium lactate is the most convenient preparation to administer and that it is important in retention and assimilation.

Uterine fibroids not only act as foreign bodies but have a toxic influence on the ovarian follicles and accelerate the muscular activity of the uterus. Uchigaki¹¹¹ looks upon these factors as additional causes of sterility arising from uterine myoma.

According to Schroeder, ovulation occurs between the fourteenth and sixteenth day. L. Fraenkel's researches indicate that ovulation occurs between the eighteenth and nineteenth day in twenty-eight-day menstrual cycles; but in twenty-four-day menstrual cycles, it occurs on the eleventh day. Delayed coitus in the latter type of menstruation may be a possible factor in sterile marriages. Two cases of sterility due to erroneous interpretations of the Mosaic laws concerning delay of coitus after menstruation are reported by Kurzok.¹¹²

Rubin's^{113, 114} studies on the intramural and isthmic portions of the fallopian tube have thrown much light on the true anatomic course and physiologic functions of the tubes. Tubal contractions can be seen with the aid of intrauterine lipoidol injections but isthmospasm

has not been definitely demonstrated as an entity. Jarcho¹¹⁵ believes that there is a "tubal sphincter" of the fallopian tube and that iodized oils have a therapeutic use in gynecology. Intrauterine injections of iodized oil are not entirely safe. Although Hirst¹¹⁶ and Stone¹¹⁷ consider the technic as a very simple procedure, Ries¹¹⁸ presented a case with extensive pathologic lesions in the pelvis following such injection. To avoid the extensive spills in the vagina, Stein and Arens¹¹⁹ have devised a practical, self-retaining instrument for the Rubin test and iodized oil instillation. Another type of self-retaining uterine cannula is described by Levy.¹²⁰

EXTRAUTERINE PREGNANCY

Many etiologic causes of extrauterine pregnancy have been described but careful study reveals that infection is the most common causative factor. Falk¹²¹ believes that the end-result of mild infection of the tube is the production of pseudoglands or of a follicular salpingitis in a large percentage of the cases and that the ectopic nidus corresponds to the sites of the follicular changes.

The diagnosis of extrauterine pregnancy occasionally taxes the skill of the most expert. Kruger-Franke¹²² et al. place more reliance on the clinical picture than on the many laboratory tests. Leucocytosis and polychromasia may be of value in doubtful cases. As the last diagnostic method Vollmann¹²³ employs exploratory puncture of the abdominal cavity. The results obtained with this procedure are frequently decisive and the method much less dangerous than the routine spinal puncture. In a series of 32 cases of ectopic pregnancy Allen¹²⁴ found that spotting was the most constant symptom, pain ranking second. Larrainzer¹²⁵ found the amidopyrine test applied in 10 cases of ectopic pregnancy, positive in eight. Most tubal pregnancies are ampullar or isthmie. A case of intraligamentous pregnancy at full term is recorded by Magid¹²⁶ and a case of interstitial pregnancy by Palma.¹²⁷

The occurrence of simultaneous extrauterine and intrauterine pregnancy is more common than recognized. Stein¹²⁸ collected 35 cases reported since 1913 and describes an additional case. Rulle's¹²⁹ case was erroneously diagnosed as appendicitis but the true condition was easily recognized at operation. An unusual case of bilateral tubal pregnancy is reported by Schochaert.¹³⁰

Failure to properly complete the pelvic toilet after bilateral salpingectomy may result in a subsequent ectopic or intrauterine pregnancy. Zangemeister's¹³¹ patient gave a history of excision of the left tube for an ectopic pregnancy in 1925. In 1926 she was operated upon for a right tubal pregnancy. This was followed by an intrauterine pregnancy ending in abortion. A somewhat similar case is recorded by Burchard.¹³² This patient was operated upon on two separate occasions for right and left tubal pregnancy and two years later passed through a normal pregnancy.

These sequelae can be avoided if the tubes are completely excised and the uterine wound properly covered with peritoneum. Mere ligation of the tubes does not protect the patient from a subsequent pregnancy. This is well illustrated in a recent case report by Schwarzwaller¹³³ in which a tubal pregnancy occurred six years after bilateral ligation of the tubes for the purpose of sterilization.

In view of the fact that primary abdominal pregnancy does not exist in the lower animals, often doubt is expressed in regard to its occurrence in the human. Such writers as Hirst, Krupe and Grove, however, have described specimens which appear to fulfill all the requirements so that it becomes necessary to readopt this variety of cases into the group of extrauterine pregnancies. Furgason¹³⁴ describes in detail a case of primary abdominal pregnancy that was carried ten months past the date of expected confinement. Williamson,¹³⁵ Jean-neney and Villar,¹³⁶ Carrell,¹³⁷ and Wagner¹³⁸ recorded cases of abdominal pregnancy.

Haeusermann¹³⁹ performs a Douglas puncture in nearly all cases of suspected ectopic pregnancy. Only three of the cases, in a series of 283, subsequently developed abscesses in the posterior culdesac. The author believes that salpingo-oophorectomy leaves better conditions for healing than salpingectomy.

An unusual case of primary ovarian pregnancy with hydatidiform degeneration is reported by Fraser.¹⁴⁰

MALIGNANCY

The cancer problem today is not a one-man job.¹⁴¹ It requires all the resources and all the professional talent of a large general hospital and its research institute to deal effectively with the disease in its many phases.

In the report of the Committee on the Treatment of Malignant Diseases with Radium and X-ray, Greenough¹⁴¹ states that the published reports of the end-results in cancer cases from different clinics have been prepared under such different conditions that no combination of the figures presented is possible, and the advantage of large numbers of cases, in eliminating individual errors and exceptions, is thereby lost. This is of the greatest importance in the proper evaluation of treatments. There are honest differences of opinion among those well qualified to judge even as regards the value of surgery and irradiation therapy.

So long as we possess no exact clue in regard to the true nature of malignancy we can only speculate as to the correct road for investigation.

MacCarty¹⁴² believes that malignant cells have definite morphologic and volumetric characteristics which distinguish them from adult and regenerating cells. He claims that malignant cells actually exist before the invasion of tissues and can be recognized in fresh unfixed condition with an oil lens. Another futuristic method in pathology is the malignant index proposed by Hueper¹⁴³ to determine the prognosis of carcinomas of cervical cancers. On another point of the compass of modern research is the concentration of organologic location of tumors reported by Pearl and Bacon.¹⁴⁴ These authors found in a series of 816 cases of malignant neoplasms that tumors in the male occur most often in the alimentary tract and associated glandular organs, and in the females in the reproductive system.

Naturally one may expect to find quite opposite statistics of location of tumors in China. This is verified in Maxwell's¹⁴⁵ analysis of 1333 cases of malignant diseases among the Chinese. The organs most frequently affected are the breast, penis, and uterus in order named. Cancer of the intestinal tract appears to be astonishingly rare as compared to its incidence in America.

It has been shown that an unbalanced vitamine diet,¹⁴⁶ with emphasis on Vitamine B, favors the origin and development of tumors in rats.

Dyas¹⁴⁷ describes a case of carcinoma of the uterus resulting from a metal pessary, introduced seven years previously. Chronic irritation is given as the cause of cancer. Fischer-Wasels¹⁴⁸ objects to the irritation theory of malignancy on the ground that it means nothing, since every vital process is connected with irritation.

Cells of tissue cultures are killed by exposure to freezing for more than five minutes. This is likewise true of skin flaps exposed to liquid air for two minutes. However, it has been found by Koose and Lemmel¹⁴⁹ that mouse carcinoma and chicken sarcoma are successfully transplanted without any apparent loss of virulence even though exposed to liquid air for from thirty minutes to four days. It appears that these experiments prove the existence of a transmissible, extracellular carcinoma substance. Likewise normal tissue is more resistant to radium than experimental tar cancer cells in the white mouse.¹⁵⁰ There is also an increased growth followed by diminished ratio of growth after injection of serum from another animal.¹⁵¹ Of late both serious, and pseudoscientific reports of early cancer diagnosis with various serologic methods have been published. Cioffari and Akkerstein¹⁵² tried the Pignotti, Roffo, Brossa-Bozzolo-Lombardi, Botelho, and Kahn tests in 60 cases of neoplasms, 15 pregnancies and 87 miscellaneous diseases. The Pignotti test gave in pregnancy 40 per cent and in neoplastic conditions 68.3 per cent positive results. The other tests (Roffo-Brozza) gave about the same percentages as the Botelho and Kahn tests. It is not within the scope of this review to go into details about these tests. Essentially the Botelho reaction is simply a precipitation of the albuminoid substances of the serum in an acid medium by a nonspecific precipitating reagent. As shown by Mondain, Douris and Beck¹⁵³ this test is not specific for cancer.

Another point worthy of special mention is the mechanism of defense reaction against carcinoma. Lahm¹⁵⁴ maintains that a defense zone or a defense reaction does not consist in the presence or formation of connective tissue.

Healey and Cutler¹⁵⁵ believe that there is a relation between structure and prognosis in cervical carcinomas under irradiation treatment. It appears that the more important factor in prognosis of operable cervical carcinomas is the clinical determination of involvement of the cervical parametrium and broad ligament induration. This latter condition was found by Martzloff¹⁵⁶ to be present in two-thirds of the cases considered good operable risks. In other words, it is more important for prognosis to determine the degree of metastasis than the cytologic type of malignant cells. Another not infrequent occurrence in the cervix is the replacement of cylindrical epithelium with the squamous type. Fluhman¹⁵⁷ has found this condition present in 59 of 1195 specimens of the cervix, and in 29 of 100 cervical mucous polypi. This is a very important question to be considered when there is justified doubt as to the diagnosis of beginning cancer.

TREATMENT OF MALIGNANCY

It is generally conceded that the treatment of carcinoma of the cervix and of the uterine body should be considered in separate groups. Surgery is the method par excellence for corpus involvement when this procedure may be undertaken.¹⁵⁸ Some of our leading authorities

have almost abandoned surgery in preference to radium and x-ray treatment in cases of cervical carcinoma.

The rising recorded death rate from cancer is a definite evidence that treatment of the disease is as yet very defective (Shore¹⁵⁹). Polak,¹⁶⁰ in a review on the present status of therapy of cancer of the uterus, concludes that in this country and Europe radium has replaced the radical operation in the treatment of all cases of cervical cancer except possibly in incipient growths upon the portal surface. Ward and Farrar,¹⁶¹ in their report of radium results in two further five year series, conclude that there are just as good results to be obtained with radium as in the radical operation but with less primary mortality and less morbidity. Carranza and Roffo¹⁶² report on more than 500 cases of uterine cancer treated with roentgen ray since 1923. They found no relation between the histologic type and the post irradiation course. No cures were reported in this series as most of the cases were inoperable. In Mowat's¹⁶³ series of 50 cases, 48 were inoperable. The end-results are similar to those reported by other workers. Hoed's¹⁶⁴ report embraces the first ten years of the Cancer Research Institute at Amsterdam. The larger doses of radium (4000 to 7000 mg.) combined with roentgen ray are recommended.¹⁶⁴

The treatment of malignant tumors with roentgen rays plus intravenous injection of dextrose failed to confirm the suggested usefulness of this method in Fullsack's¹⁶⁵ series of 35 cases. Gal's¹⁶⁶ observation embraces 1400 cases of cancer of the female genitalia treated by irradiation in the Budapest clinic. Operative removal and irradiation have proved thus far to be the only methods of real value. Smith¹⁶⁷ et al. give an analysis of cases of cervical carcinoma treated between 1875 and 1927 at the Boston Free Hospital. A study of their paper reveals that there are too many factors involved to draw accurate scientific conclusions.

The stampede to lead-therapy warns us that radiotherapy of malignancy is yet defective. Wyard¹⁶⁸ treated 40 cases with colloidal lead intravenously; only one of them has shown improvement, while the majority of patients are dead or obviously much worse than before treatment. Ullman¹⁶⁹ employs solutions of lead. Orthophosphate of lead keeps indefinitely at room temperature. While there were encouraging results with this form of therapy the author does not believe it should, at present, take the place of the time tried methods of surgery and radiation, but should be reserved for those unfortunate individuals who are beyond the reach of either. Brookfield¹⁷⁰ found a marked temporary anemia and an increase in platelets to follow lead-therapy. Mattram¹⁷¹ employs a combination of radiation and lead-therapy. Negative results are reported by Marsh and Simpson with 145 chemical compounds found in, or derivable from, coal tar administered in cases of spontaneous tumors of mice.

Isamine,¹⁷² radion,¹⁷³ cerium iodide,¹⁷⁴ emetine and antimony salts¹⁷⁵ are reported as means of treatment in carcinoma. It need not be recalled that these methods are employed purely experimentally.

There is justified doubt whether surgical diathermy offers any advantage over the surgical procedures. Simons¹⁷⁶ claims less recurrence and inoculation metastasis than in treatment with the knife. It is evident that the final chapter in treatment of carcinoma of the pelvic organs has not yet been written.

OVARY

Novak¹⁷⁷ gives a very interesting résumé of the present status of ovarian therapy. It is along the lines of physiology that the most important advances in gynecology are being made. There have been numerous contributions made in regard to the functions of the ovary (internal secretion) but unfortunately there are many points about which investigators do not agree. Administration of ovarian substances by mouth does not produce the clinical results so frequently heralded by the manufacturers either because they do not contain the active principle or principles of the ovary or because this substance is destroyed by the alimentary juices. It appears from the recent researches of Weichert¹⁷⁸ that the view of Emil Novak is correct, namely, that both the follicle and corpus luteum hormones are of importance, and that the latter can exert its effect only when the field has been prepared, so to speak, by the follicle hormone. Amenorrhea, delayed puberty, premature menopause with the associated vasomotor symptoms, and possibly some of the so-called primary dysmenorrheas can be ascribed to a hypofunction of the ovary. There is very little evidence concerning the hyperfunction of the ovary. Perhaps the only conditions that can be ascribed to a hyperfunction are the so-called functional uterine bleedings at puberty or, more frequently, bleeding encountered at the menopause. Hirst¹⁷⁹ obtained clinical results in five cases of sterility with ovarian follicle hormone. This work is interesting but should be more closely investigated in the laboratory before we express too dogmatic views on this important subject. Robert Frank and Goldberger¹⁸⁰ have thrown much light on some of the obscurer diseases of women by means of the quantitative blood test for sexual hormone. It may also be employed with advantage to diagnose early pregnancies. In a series of experiments with paramécia, Estes and Burge¹⁸¹ found that there was an increase of sugar metabolism produced by ovarian substance. Hornung¹⁸² does not concur in these views. In his study of 150 cases of various functional disturbances of the ovary, he failed to find that the ovary exercised any direct influence on either the basal metabolism or the specific dynamic action of foodstuffs.

Transplantation of the ovaries, as a rule, is not permanent although Schultze¹⁸³ obtained permanent success in 42 per cent of 38 cases for periods varying from two and one-half to six years. Absence of function or destruction of the ovaries is associated with loss of uterine function. Stern¹⁸⁴ employed this principle in therapeutic abortion in 31 cases in which surgical intervention was contraindicated. The author believes that when properly applied this procedure is without danger to the patient.

Not infrequently profuse intraabdominal hemorrhages simulating ruptured ectopic pregnancies are due to rupture of ovarian,^{185, 186} or corpus luteum cysts.¹⁸⁷

Torsion of ovarian cysts occurs more frequently than recognized. Araya and Carbo¹⁸⁸ found 10 per cent of twisted pedicles in 176 cases of ovarian cysts. An unusual case of torsion of an ovarian cyst is recorded by Kincaid and Andrews¹⁸⁹ in a five-year-old child.

As a general rule dermoids are unilateral although Poppen¹⁹⁰ not infrequently encountered them bilaterally. X-ray proves a valuable

adjunct in the diagnosis as the bony structures (teeth) can frequently be seen on the plates. On rare occasions dermoids may simulate pregnancy.¹⁹¹

Many rare tumors of the ovary have been recorded in the literature during the past year. Hunt and Simon¹⁹² report a carcinoma of the ovary in an infant seventeen months old; Read¹⁹³ describes a chorioma; Neumann¹⁹⁴ a bilateral hypernephroma; Zalka¹⁹⁵ an ectopic chorio-epithelioma of liver and ovary, and Southam¹⁹⁶ a sarcoma of the right ovary in a three-year-old girl who was sexually precocious.

REFERENCES

- (1) Editorial, J. A. M. A. 91: 399, 1928. (2) Ohio State M. J. 24: 269, 1928.
- (3) Cited by Hunt: J. Lab. & Clin. Med. 13: 327, 1928. (4) Tuberculosis, London 9: 57, 1928. (5) Deutsche med. Wchnschr., Berlin 54: 776, 1928. (6) J. Clin. Invest. 5: 531, 1928. (7) J. A. M. A. 90: 1005, 1928. (8) Surg. Gynec. Obst. 47: 201, 1928. (9) Am. J. Roentgenol. 20: 30, 1928. (10) Surg. Gynec. Obst. 46: 155, 1928. (11) Am. J. Physiol. 85: 106, 1928. (12) Editorial, J. A. M. A. 91: 249, 1928. (13) J. A. M. A. 90: 840, 1928. (14) AM. J. OBST. & GYNEC. 15: 528, 1928. (15) Lancet 214: 1221, 1928. (16) M. J. & Rec. 127: 30, 1928. (17) AM. J. OBST. & GYNEC. 15: 453, 1928. (18) Bulletin de la Soc. d'Obst. et de Gynec. 16: 712, 1928. (19) New York State J. Med. 28: 129, 1928. (20) Surg. Gynec. Obst. 46: 832, 1928. (21) J. Lab. & Clin. Med. 13: 550, 1928. (22) AM. J. OBST. & GYNEC. 15: 167, 1928. (23) AM. J. OBST. & GYNEC. 16: 118, 1928. (24) AM. J. OBST. & GYNEC. 15: 40, 1928. (25) J. A. M. A. 91: 607, 1928. (26) J. A. M. A. 91: 462, 1928. (27) Surg. Gynec. Obst. 46: 72, 1928. (28) Arch. Surg. 16: 416, 1928. (29) Surg. Gynec. Obst. 46: 281, 1928. (30) New England J. Med. 198: 447, 1928. (31) New England J. Med. 199: 59, 1928. (32) Presse Med., Paris 36: 291, 1928. (33) J. A. M. A. 91: 555, 1928. (34) Gazette des Hosp., Paris 101: 56, 1928. (35) Progres. méd., Paris 54: 49, 1928. (36) Zentralbl. f. Chir., Leipzig 55: 1100, 1928. (37) AM. J. OBST. & GYNEC. 15: 196, 1928. (38) Wien. klin. Wchnschr. 40: 1577, 1928. (39) AM. J. OBST. & GYNEC. 15: 701, 1928. (40) J. A. M. A. 90: 455, 1928. (41) Surg. Gynec. Obst. 46: 36, 1928. (42) AM. J. OBST. & GYNEC. 15: 420, 1928. (43) AM. J. OBST. & GYNEC. 16: 28, 1928. (44) AM. J. OBST. & GYNEC. 15: 861, 1928. (45) J. Obst. & Gynec. Brit. Emp. 35: 498, 1928. (46) Ztschr. f. Geburtsh. u. Gynäk. 92: 338, 1928. (47) Gynec. et Obst. 18: 18, 1928. (48) Surg. Gynec. & Obst. 46: 830, 1928. (49) Surg. Clin. North Amer. 8: 783, 1928. (50) Nederl. Naandschr. v. Geneesk. 14: 523, 1928. (51) AM. J. OBST. & GYNEC. 16: 348, 1928. (52) AM. J. OBST. & GYNEC. 16: 11, 1928. (53) Surg. Gynec. Obst. 46: 337, 1928. (54) AM. J. OBST. & GYNEC. 15: 224, 1928. (55) British M. J. 1: 544, 1928. (56) Zentralbl. f. Gynäk. 52: 674, 1928. (57) J. de méd. de Bordeaux et du Sud. Ouest. 105: 91, 1928. (58) Surg. Gynec. Obst. 46: 227, 1928. (59) AM. J. OBST. & GYNEC. 15: 783, 1928. (60) J. Obst. & Gynec. Brit. Emp. 35: 247, 1928. (61) Liege Med. 20: 861, 1927. (62) AM. J. OBST. & GYNEC. 15: 704, 1928. (63) Arch. f. Exper. Path. u. Pharmakol. 128: 82, 1928. (64) Indian J. M. Research 15: 571, 1928. (65) Lancet 1: 443, 1928. (66) J. A. M. A. 90: 1015, 1928. (67) British M. J. 2: 1223, 1927. (68) Surg. Gynec. Obst. 47: 56, 1928. (69) AM. J. OBST. & GYNEC. 15: 390, 1928. (70) Arch. f. Gynäk. 131: 588, 1928. (71) New England J. Med., Boston 198: 927, 1928. (72) J. A. M. A. 90: 1216, 1928. (73) British M. J. 1: 431, 1928. (74) Surg. Gynec. Obst. 46: 855, 1928. (75) Surg. Gynec. Obst. 46: 403, 1928. (76) AM. J. OBST. & GYNEC. 15: 220, 1928. (77) AM. J. OBST. & GYNEC. 15: 493, 1928. (78) AM. J. OBST. & GYNEC. 15: 373, 1928. (79) AM. J. OBST. & GYNEC. 15: 675, 1928. (80) AM. J. OBST. & GYNEC. 16: 61, 1928. (81) Zentralbl. f. Gynäk., Leipzig 51: 3111, 1928. (82) Monatschr. f. Geburtsh. u. Gynäk., Berlin 78: 406, 1928. (83) J. A. M. A. 89: 1838, 1927. (84) Anat. Record 35: 13, 1927. (85) Anat. Record 35: 1, 1927. (86) AM. J. OBST. & GYNEC. 15: 534, 1928. (87) Anat. Record 18: No. 3, 1920. (88) AM. J. OBST. & GYNEC. 15: 658, 1928. (89) Zentralbl. f. Gynäk. 52: 693, 1928. (90) Arch. f. Gynäk., Berlin 134: 322, 1928. (91) AM. J. OBST. & GYNEC. 15: 344, 1928. (92) AM. J. OBST. & GYNEC. 15: 212, 1928. (93) Zentralbl. f. Gynäk., Leipzig 51: 2743, 1928. (94) Monatschr. f. Geburtsh. u. Gynäk. 78: 417, 1928. (95) Surg. Gynec. Obst. 46: 525, 1928. (96) Read before the Chicago Gynecological Society, 1927. (97) Surg. Gynec. Obst. 47: 334, 1928. (98) Surg. Gynec. Obst. 47:

- 329, 1928. (99) AM. J. OBST. & GYNEC. 15: 191, 1928. (100) Canad. M. A. J. 18: 151, 1928. (101) AM. J. OBST. & GYNEC. 16: 38, 1928. (102) Surg. Gynec. Obst. 47: 710, 1928. (103) J. A. M. A. 90: 1853, 1928. (104) J. A. M. A. 90: 507, 1928. (105) Nebraska State M. J., Norfolk 13: 226, 1928. (106) J. A. M. A. 91: 384, 1928. (107) J. A. M. A. 90: 111, 1928. (108) AM. J. OBST. & GYNEC. 15: 56, 1928. (109) Japanese J. Obst. & Gynec. (From J. A. M. A.) 11: 2, 1928. (110) M. J. & Record 127: 35, 1928. (111) Japanese J. Obst. & Gynec. 11: 2, 1928. (112) AM. J. OBST. & GYNEC. 15: 546, 1928. (113) J. A. M. A. 90: 99, 1928. (114) Surg. Gynec. Obst. 46: 87, 1928. (115) Surg. Gynec. Obst. 46: 752, 1928. (116) AM. J. OBST. & GYNEC. 15: 797, 1928. (117) AM. J. OBST. & GYNEC. 15: 662, 1928. (118) Read before Chicago Gynecological Society, 1928. (119) AM. J. OBST. & GYNEC. 15: 707, 1928. (120) AM. J. OBST. & GYNEC. 15: 712, 1928. (121) AM. J. OBST. & GYNEC. 15: 821, 1928. (122) Ztschr. f. Geburtsh. u. Gynäk. 92: 428, 1928. (123) Deutsche med. Wehnschr., Berlin 54: 901, 1928. (124) AM. J. OBST. & GYNEC. 15: 540, 1928. (125) Arch. de med. cir. y. espec. 28: 176, 1928. (126) AM. J. OBST. & GYNEC. 15: 859, 1928. (127) AM. J. OBST. & GYNEC. 15: 699, 1928. (128) AM. J. OBST. & GYNEC. 15: 159, 1928. (129) Zentralbl. f. Gynäk., Leipzig 52: 1590, 1928. (130) Bruxelles méd. 8: 833, 1928. (131) Zentralbl. f. Gynäk., Leipzig 52: 411, 1928. (132) Zentralbl. f. Gynäk., Leipzig 52: 1070, 1928. (133) Zentralbl. f. Gynäk., Leipzig 52: 1459, 1928. (134) J. A. M. A. 90: 436, 1928. (135) AM. J. OBST. & GYNEC. 15: 215, 1928. (136) Gynec. et Obst. 17: 209, 1928. (137) AM. J. OBST. & GYNEC. 15: 111, 1928. (138) Indiana State M. J. 21: 154, 1928. (139) Zentralbl. f. Gynäk., Leipzig 21: 154, 1928. (140) J. Obst. & Gynec. Brit. Emp. 34: 788, 1928. (141) Surg. Gynec. Obst. 46: 159, 1928. (142) J. Lab. & Clin. Med. 13: 354, 1928; and Surg. Gynec. Obst. 47, 566, 1928. (143) Surg. Gynec. Obst. 47: 502, 1928. (144) Arch. Path. 67: 1928. (145) China M. J. 42: 69, 1928 (Abst. J. A. M. A.). (146) Ztschr. f. Krebsforsch. 26: 353, 1928. (147) J. A. M. A. 90: 457, 1928. (148) Schweiz. med. Wehnschr., Basel 58: 473, 1928. (149) Beitr. z. klin. Chir., Berlin 489: 1927. (150) Ztschr. f. Krebsforsch. 26: 386, 1928. (151) Ztschr. f. Krebsforsch. 27: 104, 1928. (152) Tumori, Milan 1: 371, 1927. (153) Ann. de l'Institut. Pasteur, Paris 41: 1097, 1927. (154) Strahlentherapie, Berlin 28: 779, 1928. (155) AM. J. OBST. & GYNEC. 16: 15, 1928. (156) Surg. Gynec. Obst. 47: 183, 1928. (157) AM. J. OBST. & GYNEC. 15: 1, 1928. (158) Bibliot. f. Laeger, Copenhagen 120: 327, 1928. (159) J. A. M. A. 90: 1690, 1928. (160) AM. J. OBST. & GYNEC. 15: 26, 1928. (161) J. A. M. A. 91: 296, 1928. (162) Bol. de la Soc. d'Obst. y. Ginec., Buenos Aires 6: 508, 1928. (163) Glasgow M. J. 90: 142, 1928. (164) Nederl. Tijdschr. v. Geneesk., Amsterdam 71: 2132, 1927. (165) Strahlentherapie, Berlin 28: 795, 1928. (166) Strahlentherapie, Berlin 27: 27, 1927. (167) AM. J. OBST. & GYNEC. 15: 637, 1928. (168) British M. J. London 1: 838, 1928. (169) Surg. Gynec. Obst. 46: 119, 1928. (170) British M. J. 1: 132, 1928. (171) J. Path. & Bact. 31: 277, 1928. (172) Klin. Wehnschr. 7: 756, 1928. (173) Rev. méd. de la Suisse Rom. 48: 563, 1928. (174) Ztschr. f. Krebsforsch. 27: 132, 1928. (175) Riforma med. 44: 622, 1928. (176) Ztschr. f. Krebsforsch. 27: 90-103, 1928. (177) J. A. M. A. 91: 607, 1928. (178) Proc. Soc. Exper. Biol. & Med. 25: 490, 1928. (179) AM. J. OBST. & GYNEC. 15: 487, 1928. (180) J. A. M. A. 90: 106, 1928. (181) AM. J. OBST. & GYNEC. 15: 847, 1928. (182) Zentralbl. f. Gynäk. 51: 2971, 1927. (183) Zentralbl. f. Gynäk. 52: 29, 1928. (184) Am. J. Roentgenol. 19: 133, 1928. (185) Zentralbl. f. Gynäk. 52: 165, 1928. (186) Zentralbl. f. Chir., Leipzig 55: 1612, 1928. (187) AM. J. OBST. & GYNEC. 15: 513, 1928. (188) Rev. Med., Buenos Aires 239: 1927. (189) AM. J. OBST. & GYNEC. 15: 207, 1928. (190) AM. J. OBST. & GYNEC. 15: 236, 1928. (191) Clin. obstet. 30: 72, 1928. (192) Ann. Surg. 87: 84, 1928. (193) Proc. Royal Soc. Med., London 21: 1331, 1928. (194) Arch. f. Gynäk. 131: 574, 1928. (195) Am. J. Path. 4: 59, 1928. (196) British M. J. 1: 661, 1928.

AUTHORS INDEX*

A

- ADAIR, FRED L., AND McDONALD, ROBERT E., Varix of the umbilical cord with report of a case, 836
- , AND TIBER, L. J., Infection in the puerperium, with analysis of 8000 cases, 559, 702
- ALBRECHT, H., Marital fertility and diminished birth rate in Europe, 737 (Abst.)
- ALLEN, EDWARD, Regurgitation of menstrual blood from one of double uteri caused by congenital atresia, 868
- , AND GOLDTHORPE, H. C., A comparison of blood calcium levels between and during menstrual periods, 789
- , AND —, A study of the use of parathormone in the control of menstrual bleeding, 344
- ANCEL, P., AND BOUIN, P., Concerning the biologic action of the corpus luteum, 144 (Abst.)
- ARAYA, A method of accomplishing internal podalic version in the absence of amniotic fluid, 442 (Abst.)
- ASCHHEIM, S., Hormone and pregnancy, 140 (Abst.)
- , AND ZONDEK, B., Hormones of the anterior lobe of the pituitary and of the ovary in the urine of pregnant women, 141 (Abst.)
- , AND —, Ovum and hormone, 143 (Abst.)
- , AND —, Pregnancy test, 141 (Abst.)
- , (WITH ZONDEK, B.), Anterior lobe of the pituitary, 139 (Abst.)
- , (WITH ZONDEK, B.), The hormone of the anterior lobe of the hypophysis, 139 (Abst.)
- ASCHNER, B., The advantages of conservative operations for myomata over radical operations or roentgen castration, 289 (Abst.)
- ATLEE, EDWARD D., Preliminary report on treatment of congenital lues, 416

B

- BABCOCK, W. WAYNE, The vaginal approach for certain intraperitoneal operations, 573, 695
- BAER, JOSEPH L., AND REIS, RALPH A., The interposition operation for prolapse of the uterus, 233, 269

- BALDWIN, J. F., Routine removal of the appendix in all abdominal operations by a suitable technic, 449
- BECKMAN, HARRY, Magnesium sulphate dosage in synergistic analgesia and in tetanus, 735
- BLAND, P. BROOKE, Pyometra following radium therapy for uterine cancer, 528, 718
- BLEVINS, W. J., Episiotomy with modified operative technic, 197
- BLOCK, FRANK B., (WITH KEENE, FLOYD E.), The treatment of uterine fibromyomas, 848, 880
- BLOOM, BENSON, (WITH STEIN, IRVING F.), Report of a case of leiomyoblastoma and papillary cystoma of the ovary, 820
- BLOTEVOGEL, W., (WITH DOHRN, M., FAURE, W., AND POLL, H.), Tokoinine, vegetable substances with activity resembling sex hormones, 138 (Abst.)
- BOUIN, P., (WITH ANCEL, P.), Concerning the biologic action of the corpus luteum, 144 (Abst.)
- BRIGGS, FRANCES, (WITH DENIS, W., AND KING, E. L.), The ratio of urea nitrogen to total nonprotein nitrogen in the blood in normal pregnancy, 386
- BUBIS, J. L., Report on seventy-six cases of ectopic gestation, 74
- BUCURA, C., The constitutional indications for episiotomy, 448 (Abst.)
- BUGBEE AND SIMOND, The effects of injections of ovarian follicular hormone on body growth and sexual development of male and female rats, 137 (Abst.)
- BURR, CHARLES W., Neurologic symptoms in the pregnant woman, 653, 727

C

- CALKINS, L. A., Factors governing blood loss in the third stage of labor, 578, 701
- CAMPBELL, LLOYD A., An improved anal shield, 873
- CAREY, JAMES B., (WITH LITZENBERG, JENNINGS C.), The relation of basal metabolism to gestation, 550, 707
- CASTANO, CARLOS ALBERTO, An etiologic and pathologic study of uterine hemorrhages in myoma and hem-

*Index to pages of the Journal, Vol. XVII, January-June, 1929, January, pages 1-150; February, pages 151-296; March, pages 297-452; April, pages 453-602; May, pages 603-760; June, pages 761-902.

- Castano, Carlos Alberto—Cont'd
 orrhagic uterine affections, 284 (Abst.)
- CASTRO, ROCCO, Biologic sterilization of the female with injections of seminal fluid, 147 (Abst.)
- CLELAND, FREDERICK A., The radium treatment of fibroids and fibrosis uteri, 508, 718
- CORVESE, ANTHONY, Carcinoma of fundus of uterus following Watkins' interposition operation, 239

D

- DANNREUTHER, WALTER, Radiotherapy in the treatment of cancer of the cervix, 524, 718
- DEAVER, J. B., AND REIMANN, S. P., Treatment of uterine fibroids; with remarks on pathology of fibroids, 288 (Abst.)
- DE GUCHTENEERE, Medical induction of labor, 440 (Abst.)
- DELMAS, P., Extemporaneous evacuation of the uterus at the end of pregnancy, 440 (Abst.)
- DENIS, (WITH PATEL), Necrobiosis of uterine fibroids, 287 (Abst.)
- , W., KING, E. L., AND BRIGGS, FRANCES, The ratio of urea nitrogen to total nonprotein nitrogen in the blood in normal pregnancy, 386
- DIASIO, JOSEPH S., (WITH JOHNSON, HAROLD H.), Bilateral tubal pregnancy with rupture of both tubes, 116
- DICKINSON, G. K., The liver as it functions in operations in the female abdomen, 687
- DIECKMANN, WILLIAM J., The hepatic lesion in eclampsia, 454, 696
- DOHRN, M., Is the Allen Doisy test specific for the female sex hormone? 142 (Abst.)
- , AND FAURE, W., The excretion of the female sex hormone, 139 (Abst.)
- , —, POLL, H., AND BLOTEVOGEL, W., Tokoinine, vegetable substances with activity resembling sex hormones, 138 (Abst.)
- DORLAND, W. E. N., So-called everted variety of papillary cystadenoma of the ovary, 132
- DUNCAN, HARRY A., Combined intra- and extrauterine pregnancy advanced to the sixth month, 878
- DUPONT, R., (WITH LHERMITTE, J.), The innervation of the ovary, 292 (Abst.)

E

- EMMONS, ARTHUR B., II., Maternal mortality and its prevention, 738
- ESSEN-MÖLLER, ELIS, One thousand laparotomies for myoma of uterus, 291 (Abst.)

F

- FALLS, FREDERICK HOWARD, Hyperthyroidism complicating pregnancy, 536, 709
- FAURE, W., (WITH DOHRN, M.), The excretion of the female sex hormone, 139 (Abst.)
- , (WITH DOHRN, M., POLL, H., AND BLOTEVOGEL, W.), Tokoinine, vegetable substances with activity resembling sex hormones, 138 (Abst.)
- FAWCETT, HADFIELD, AND PHILLIPS, Suprarenal virilism, 149 (Abst.)
- FERNANDEZ, Maneuver to overcome the difficulty caused by Bandl's ring in internal podalic version, 442 (Abst.)
- FINDLEY, PALMER, The teaching of obstetrics, 709
- FIRGAU, L., The increase in Basedowoid disease in women since the war and its explanation, 759 (Abst.)
- FISCHER, G., Some observations on craniotomy at the woman's clinic at Lund, 442 (Abst.)
- FLEISCHER, ABRAHAM J., Case of intestinal obstruction simulating twisted ovarian cyst, 109
- FOGELSON, SAMUEL J., Cholecystography as an aid in determining gall bladder stasis in pregnancy, 613, 731
- FOSSATI, Permanent enlargement of the pelvis, 446 (Abst.)
- FRANK, ROBERT T., New Books, 426 (Collective Review)
- , AND GOLDBERGER, M., Clinical data obtained with the female hormone blood test, 142 (Abst.)
- FRANKL, O., Inflammatory changes in myomata, 287 (Abst.)
- FRANQUÉ, O., Evil results of high forceps operations (rupture of the uterus, air embolism, separation of the pelvis, lacerations of the bladder) and their prevention, 445 (Abst.)
- FRUHHINSHOLZ, A., A case of fetal death following external version, 441 (Abst.)
- FULLERTON, WILLIAM D., Fibroid tumors of the vulva, 284 (Abst.)

G

- GALLOWAY, CHARLES EDWIN, Anemia in pregnancy, 84, 136
- GARDINER-HILL AND SMITH, Menorrhagia as a symptom of myxedema, 226 (Abst.)
- GEIST, SAMUEL H., AND MATUS, MORRIS R., The relation of ectopic gestation to the associated uterine changes and vaginal bleeding, 151

- GIBBERD, G. F., Induction of labor with animal bladders containing glycerine, 439 (Abst.)
- GIUSEPPI, P. L., The treatment of uterine fibroids by myomectomy, 290 (Abst.)
- GLADDEN, A. H., JR., (WITH KING, E. L.), The fetal mortality in breech presentations. Is prophylactic external version advisable? 78, 130
- GOINARD, E., AND GOINARD, P., Myomectomies, 290 (Abst.)
- GOINARD, P., (WITH GOINARD, E.), Myomectomies, 290 (Abst.)
- GOLDBERGER, M., (WITH FRANK, ROBERT T.), Clinical data obtained with the female hormone blood test, 142 (Abst.)
- GOLDTHORPE, H. C., (WITH ALLEN, EDWARD), A comparison of blood calcium levels between and during menstrual periods, 789
- , (WITH ALLEN, EDWARD), A study of the use of parathormone in the control of menstrual bleeding, 344
- GRAVES, WILLIAM P., (WITH SMITH, GEORGE VAN S., AND PEMBERTON, FRANK A.), *Procidencia*, A study of 683 cases treated between 1875 and 1928 at the Free Hospital for Women, Brookline, Massachusetts, 669
- GREENHILL, J. P., The obstetric literature of 1928, 742 (Collective Review)
- ### H
- HABERLANDT, L., Hormonal sterilization of female animals, 147 (Abst.)
- , Hormonal sterilization of female animals by means of insulin, 147 (Abst.)
- HADFIELD, (WITH FAWCETT AND PHILLIPS), Suprarenal virilism, 149 (Abst.)
- HENDRY, JAMES, Unsuccessful forceps cases (how far can they be prevented by efficient antenatal care?), 444 (Abst.)
- HERTZLER, ARTHUR E., Repair of vesicovaginal fistula, 114
- HEYN, A., The influence of ovarian function on the basal metabolism, 145 (Abst.)
- HIBBERT, G. F., Protein therapy in gynecology, 227, 272
- HILLIS, DAVID S., Premature separation of a normally implanted placenta during pregnancy, 132
- HIRSCH, H., Variations in the female sex hormone content in the blood of women, 138 (Abst.)
- HIRST, BARTON COOKE, The progress of teaching and practice in gynecology during the last four decades, 209
- HOFBAUER, J., Bone marrow stimulation in the puerperal woman by injection of pituitrin and intravenous glucose, and its clinical application, 761
- , Decidual formation on the peritoneal surface of the gravid uterus, 603
- HOFFMAN, JACOB, (WITH MAZER, CHARLES), The diagnosis of early pregnancy through the detection of female sex hormone in the urine, 186
- HOUEL AND JAHIER, Prophylactic fixation of the anterior arm in performing version and extraction in head presentations, 441 (Abst.)
- HUPERPER, WILLIAM C., The estimation of histologic malignancy from biopsy sections, 733
- HUGGINS, R. R., Problems associated with the cervix, 589, 689
- HUMPSTONE, O. PAUL, A survey of cesarean section at the Methodist Episcopal Maternity, 663
- HUNTINGTON, JAMES LINCOLN, A review of the pathology of one hundred four consecutive miscarriages in private obstetric practice, 32, 121
- ### I
- IMHAÜSER, K., Frequency and valuation of myosarcoma of the uterus, 288 (Abst.)
- IRVING, FREDERICK C., AND TAYLOR, JOSEPH V., The removal of blood plasma and the reinfusion of corpuscles in the treatment of the convulsive toxemia of pregnancy, 767, 883
- ### J
- JACOBY, ADOLPH, Further simplification of the tubal insufflation test, 871
- JAHIER, (WITH HOUEL), Prophylactic fixation of the anterior arm in performing version and extraction in head presentations, 441 (Abst.)
- JARCHO, JULIUS, Changes in the leucocytes during labor and the puerperium, 13
- JOHNSON, HAROLD H., AND DIASIO, JOSEPH S., Bilateral tubal pregnancy with rupture of both tubes, 116

K

- KEENE, FLOYD E., AND BLOCK, FRANK B., The treatment of uterine fibromyomas, 848, 880
- KENNEDY, J. W., Reactions of the peritoneum, 636, 694
- KING, E. L., AND GLADDEN, A. H., JR., The fetal mortality in breech presentations. Is prophylactic external version advisable? 78, 130
- , (WITH DENIS, W., AND BRIGGS, FRANCES), The ratio of urea nitrogen to total nonprotein nitrogen in the blood in normal pregnancy, 386
- KLINE, B. S., The decidual reaction in extrauterine pregnancy, 42
- KOLISCHER, G., Modern conceptions of renal derangements in pregnancy, 661, 730
- KOSAKAÉ, Pharmacologic research of the action of placenta extract, 354 (Abst.)
- KUPERSTEIN, DAVID, Puerperal morbidity at the Greenpoint Hospital, 865, 881
- KüstNER, O., The operative treatment of breech presentation, 446 (Abst.)

L

- LAFERTY, JOHN M., NARK, J. A., AND SWEENEY, J. J., The fluctuation of blood sugar before and after an eclamptic convulsion, 113
- LAQUEUR, E., ET AL., The presence of the female sex hormone in the urine of men, 142 (Abst.)
- LASH, A. F., The therapeutic value of a new concentrated streptococcus antitoxin in puerperal fever, 297, 424
- LAWS, GEORGE M., Results of x-ray therapy of myoma and other nonmalignant lesions of the uterus, 855
- LEDoux, LUCIEN A., Some physiologic aspects of eclamptic toxemia, 90, 130
- LEVENTHAL, M. L., (WITH STEIN, IRVING F.), Severe toxemia of pregnancy with jaundice, 244
- LHERMITTE, J., AND DUPONT, R., The innervation of the ovary, 292 (Abst.)
- LIEBESNY, P., The pituitary gland and the central regulation of the gonads, 141 (Abst.)
- LIPSCHUETZ, A., Further investigation of transplantation of artificially preserved ovaries, 149 (Abst.)
- LITZENBERG, J. C., Gross microscopic sections from specimens of ectopic pregnancy, 121
- LITZENBERG, J. C., AND CAREY, JAMES B., The relation of basal metabolism to gestation, 550, 707
- LULL, CLIFFORD B., Cesarean section, a review of 109 cases, 403, 417

M

- MACGREGOR, A. S., The effects on blood pressure of pituitrin and oxytocin in the puerperium, 125
- MACOMBER, DONALD, A statistical and clinical study of one thousand cases of sterility, 621, 720
- MANN, BERNARD, Abdominal delivery of triplets, 726
- MARKEE, J. E., Rhythmic variations in the vascularity of the uterus of the guinea pig during the estrous cycle, 205, 268
- MASON, LYMAN W., Sterility, with special reference to the spermatozoon, 376
- MASSEL, Abscess of the wall of the uterus with hemolytic streptococcus, 267
- MASSON, JAMES C., Parasitic fibromyomata, 284 (Abst.)
- MATUS, MORRIS, R., (WITH GEIST, SAMUEL H.), The relation of ectopic gestation to the associated uterine changes and vaginal bleeding, 151
- MAXWELL, W. WORTHAM, Traumatic perforation of uterus with severance of rectum, 96
- MAYER, A., Untimely rupture of the membranes, 327 (Abst.)
- MAYES, HARRY W., The use of mercurochrome as a vaginal antiseptic before cesarean section, 645, 723
- MAZER, CHARLES, AND HOFFMAN, JACOB, The diagnosis of early pregnancy through the detection of female sex hormone in the urine, 186
- MCCULLOUGH, FRANCIS J., Full-term extrauterine pregnancy with living child, 724
- MCDONALD, ROBERT E., (WITH ADAIR, FRED L.), Varix of the umbilical cord with report of a case, 836
- MCGUINNESS, F. G., Prophylactic external version in breech presentation, 441 (Abst.)
- MCGUINNESS, MARY, (WITH ROWE, ALLAN WINTER), The metabolism of galactose. V. The effect of the tolerance of the cycle of reproduction, 351
- MENDENHALL, A. M., The teaching of operative obstetrics, 583, 712
- MERRIAM, MAXWELL S., Diabetic coma complicating pregnancy, 684

- MEYER, J., A case of fibromyoma of the tube, 285 (Abst.)
- MICHAEL, WILLIAM A., A new device for performing median episiotomy, 265
- MILES, L. M., Injection of ether into the uterus, 451
- MILLER, DOUGLAS, Observations on unsuccessful forceps cases (causation, management, and end-results), 444 (Abst.)
- , The failed forceps cause and its treatment, 443 (Abst.)
- MOOTS, CHARLES W., Importance of urography in the interpretation of all obscure abdominal and pelvic cases, 718
- MOULONGUET, M. P., Intravaginal prolapse of the fallopian tube after colpotomy, 48 (Abst.)
- MUSSEY, ROBERT D., (WITH STACY, LEDA J.), Radium in the treatment of menorrhagia of adolescence and of the menopause, 502, 718

N

- NARK, J. A., (WITH LAFERTY, JOHN M., AND SWEENEY, J. J.), The fluctuation of blood sugar before and after an eclamptic convulsion, 113
- NELSON, H. M., A four-bladed speculum, 112
- NEWELL, Q. U., A myoma, a sarcoma, and a carcinoma developing in the same uterus, 191
- NIEMACK, JULIUS, Cesarean section by Fritsch's technic with a report of sixty consecutive cases without mortality, 860
- NISOT, Suppurating fibroids, 286 (Abst.)

O

- ODAGESCO, S., The results of expectant treatment in contracted pelvis and the test of labor, 447 (Abst.)
- O'KEEFE, C. D., Relation of hypothyroidism to obstetrics and gynecology, 294 (Abst.)
- OSTENDORF, L., Blood sedimentation. Its history, its theory, and its clinical significance, 293 (Abst.)
- OTT, VON D., Supravaginal amputation of the myomatous uterus or total extirpation, 291 (Abst.)

P

- PARDEE, HAROLD E. B., Experiences in the management of pregnancy complicated by heart disease, 255
- PATEL AND DENIS, Necrobiosis of uterine fibroids, 287 (Abst.)
- PAYNE, FRANKLIN L., The treatment of leucorrhea, 841, 879

- PECKHAM, C. H., Observations on sixty cases of hyperemesis gravidarum, 776
- PREIGHTAL, THOMAS C., Torsion of the fibromatous uterus, 363, 413
- PEMBERTON, FRANK A., AND SMITH, GEORGE VAN S., The early diagnosis and prevention of carcinoma of the cervix, 165
- , (WITH SMITH, GEORGE VAN S., AND GRAVES, WILLIAM P.), Procidencia, a study of 683 cases treated between 1875 and 1928 at the Free Hospital for Women, Brookline, Massachusetts, 669
- PHANEUF, LOUIS E., Complete lacerations of the perineum and their surgical treatment, 475, 687
- PHILLIPS, (WITH FAWCETT AND HADFIELD), Suprarenal virilism, 149 (Abst.)
- POLAK, JOHN OSBORN, Is surgical intervention justifiable in the treatment of metrophlebitis and thrombophlebitis of the pelvic veins? 467, 698
- POLL, H. (WITH DOHRN, M., FAURE, W., AND BLOTEVOGEL, W.), Tokoinine, vegetable substances with activity resembling sex hormones, 138 (Abst.)
- PRATHER, GEORGE C., Postpartum bladder complications, 215

Q

- QUIGLEY, JAMES KNIGHT, A study of 165 consecutive cesarean sections including a comparison between 104 classical operations and 61 laparotrachelotomies, 597, 715

R

- REED, CHARLES B., Impetigo or pyodermitis neonatorum, 49, 133
- REIMANN, S. P., (WITH DEEVER, J. B.), Treatment of uterine fibroids; with remarks on pathology of fibroids, 288 (Abst.)
- REIPRICH, W., The incertory influence of male sex glands on conception and pregnancy, 148 (Abst.)
- REIS, RALPH A., A comparative study based on five hundred consecutive cases of induction of labor, 392, 419
- , (WITH BAER, JOSEPH L.), The interposition operation for prolapse of the uterus, 233, 269
- RIES, EMIL, Effect of lipiodol injection on the tubes, 728
- ROSENFELD, SAMUEL S., Prophylactic treatment of puerperal infection by intrauterine applications of antiseptic solutions, 408

ROWE, ALLAN WINTER, AND MCGUINNESS, MARY, The metabolism of galactose. V. The effect on the tolerance of the cycle of reproduction, 351

RUBIN, I. C., Uterotubal insufflation followed by pregnancy in 205 cases out of a series of 2000 cases of infertility, 484, 692

S

SAKUMA, H., Experimental study of the excretory functions of the mucous membrane of the uterus, 293 (Abst.)

—, Pathologic and histologic changes in the uterine mucosa due to various kinds of poisons, 294 (Abst.)

SCHENK, Changes in the hypophysis of the rat after operative and x-ray castration, 143 (Abst.)

SCHMIDT, W. TH., A successful case of hebstectomy with and autotransplantation between the severed ends of the pubic bone, 447 (Abst.)

SCHOCHET, SYDNEY S., A review of the gynecologic literature of 1928, 885 (Collective Review)

—, Experimental endometriosis, 328, 413

SCHOCKAERT, Degenerating fibroid in a woman seventy-nine years of age, 286 (Abst.)

—, On the application of forceps in the superior strait, 445 (Abst.)

SCHULTZE, G. K. F., Ovarian function, potassium and calcium ion-concentration of the blood serum and the vegetative system, 145 (Abst.)

SCHULZE, MARGARET, Dry labor, an analysis of 600 cases, 20

SCHWARTZ, LEO S., The treatment of uterine injuries, 66, 123

SCOTT, R. A., Hemiplegia during pregnancy, with the report of a case, 401, 419

SEED, LINDON, Degeneration of fibromyomata of the uterus, 286 (Abst.)

SEIDES, SAUL, A modification of the classic forceps and its application, 262

—, Early adenocarcinoma of uterine body completely removed by curettage, 117

SHAW, WILLIAM FLETCHER, Unsuccessful forceps cases, 445 (Abst.)

—, Uterine fibroids after the menopause, 285 (Abst.)

SIMOND, (WITH BUGBEE), The effects of injections of ovarian follicular hormone on body growth and sexual development of male and female rats, 137 (Abst.)

SIPPEL, P., Transplantation material in homoplastic ovarian transplantation, 148 (Abst.)

SMITH, (WITH GARDINER-HILL), Menorrhagia as a symptom of myxedema, 226 (Abst.)

SMITH, GEORGE VAN S., Endometrioma, A clinical and pathologic study of 159 cases treated at the clinic of the Free Hospital for Women, Brookline, Massachusetts, 806

—, (WITH PEMBERTON, FRANK A.), The early diagnosis and prevention of carcinoma of the cervix, 165

—, GRAVES, WILLIAM P., AND PEMBERTON, FRANK A., Procidencia, a study of 683 cases treated between 1875 and 1928 at the Free Hospital for Women, Brookline, Massachusetts, 669

SMITH, MARGARET G., A study of the ovarian follicular hormone in the blood of the pregnant woman, 138 (Abst.)

SPENCER, HERBERT R., The history of British midwifery (1650-1800), 292 (Abst.)

STACY, LEDA J., AND MUSSEY, ROBERT D., Radium in the treatment of menorrhagia of adolescence and of the menopause, 502, 718

STEIN, ARTHUR, The Second International Congress of Radiology at Stockholm, July, 1928. A résumé of important papers relating to gynecology, 275 (Collective Review)

STEIN, IRVING F., AND BLOOM, BENSON, Report of a case of leiomyoblastoma and papillary cystoma of the ovary, 820

—, AND LEVENTHAL, M. L., Severe toxemia of pregnancy with jaundice, 244

STOECKEL, W., Unsuccessful obstetric attempts, 443 (Abst.)

STRAUSS, ABRAHAM, Carcinoma of the ovary after the menopause associated with recurrence of uterine bleeding, 248

SWEENEY, J. J., (WITH LAFERTY, JOHN M., AND NARK, J. A.), The fluctuation of blood sugar before and after an eclamptic convulsion, 113

T

TAYLOR, JOSEPH V., (WITH IRVING, FREDERICK C.), The removal of blood plasma and the reinfusion of corpuscles in the treatment of the convulsive toxemia of pregnancy, 767, 883

- TERADA, M., The changes in the ovaries and other organs of animals injected with various ovarian substances, 137 (Abst.)
- THOMS, HERBERT, A roentgenographic study of placental infarcts, 176
- , Marmaduke B. Wright and cephalic version, 814
- TIBER, L. J., (WITH ADAIR, FRED L.), Infection in the puerperium, with analysis of 8000 cases, 559, 702
- TITUS, Episiotomy and the immediate postpartum repair of both old and new perineal injuries, 448 (Abst.)
- TITUS, PAUL, Disturbances in carbohydrate metabolism in toxemia of pregnancy, 553, 706
- TOLAND, OWEN J., Some factors in postpartum maternal morbidity, 411, 416
- TOOMBS, PERCY W., The effects of x-ray and radium upon the fetus in utero, 516, 718
- TRIVINO, F. G., Increased uterine development by means of serum from pregnant women, 137 (Abst.)

U

- UHLMANN, F., Is there a hormonal influence on sex? 144 (Abst.)
- , Standardization of the ovarian hormone, 150 (Abst.)
- ULESCO-STROGANOWA, K., A case of multiple myomata with malignant degeneration in several nodules, 288 (Abst.)

V

- VANDER VEER, EDGAR A., The causation, prevention and treatment of postoperative distention of the abdomen, 695
- VARO, B., Forceps applied to the breech, 445 (Abst.)
- VERMELIN, H., Recurrent placental sclerosis and habitual death of fetus, 854 (Abst.)
- VIGNES, H., The use of testicular preparations in gynecologic ailments, 149 (Abst.)
- VOGT, E., Hormonal sterilization of female animals with insulin, 146 (Abst.)
- , Insulin and ovarian function, 145 (Abst.)

- VOGT, E., The dependence of insulin effect on the ovary, 146 (Abst.)

W

- WALSCHEID, A. J., Reciprocal relations between diseases of the alimentary and female genital systems, 104
- WARD, GEORGE GRAY, Radium therapy of carcinoma uteri. Ten years of clinical experience and results at the Woman's Hospital, 1, 126
- WARREN, S. B., The effects of amniotic fluid on serosa and serous surfaces, 760 (Abst.)
- WESTMAN, A., The primacy of the egg cell, 144 (Abst.)
- WILLIAMS, J. WHITRIDGE, The Sloane Hospital for Women; its development, significance and possibilities, 795
- WILLIAMS, PERCY H., Endometriosis of an abdominal scar following cesarean section, 102, 120
- WILLIAMSON, A. C., A new obstetric bed, 875
- WILSON, ROBERT A., Report of a case of placenta accreta; with a discussion of its treatment and the usual sequelae, 58
- WOLFE, SAMUEL A., Choriadenoma and choriocarcinoma of uterus, 826, 882

Z

- ZARATE, ENRIQUE, Partial symphysiotomy and the symphysiotomy of Frank, 446 (Abst.)
- ZONDEK, B., Female sex hormone in the urine, especially in pregnant women, 139 (Abst.)
- , The hormone of the ovary and the anterior lobe of the hypophysis, 140 (Abst.)
- , AND ASCHHEIM, S., Anterior lobe of the pituitary, 139 (Abst.)
- , AND —, The hormone of the anterior lobe of the hypophysis, 139 (Abst.)
- , (WITH ASCHHEIM, S.), Hormones of the anterior lobe of the pituitary and of the ovary in the urine of pregnant women, 141 (Abst.)
- , (WITH ASCHHEIM, S.), Ovum and hormone, 143 (Abst.)
- , (WITH ASCHHEIM, S.), Pregnancy test, 141 (Abst.)

SUBJECT INDEX*

A

- Abdominal scar following cesarean section, endometriosis of an, (Williams), 102, 120
- Abscess of the wall of the uterus with hemolytic streptococcus, (Masset), 267
- Adenocarcinoma of uterine body, early, completely removed by curettage, (Seides), 117
- Alimentary and female genital systems, diseases of the, reciprocal relations between, (Walscheid), 104
- Allen Doisy test, is the, specific for the female sex hormone, (Dohrn), 142 (Abst.)
- American Association of Obstetricians, Gynecologists and Abdominal Surgeons, transactions of, 687
- American Gynecological Society, officers for 1929, 884
- Amniotic fluid, effects of, on serosa and serous surfaces, (Warren), 760 (Abst.)
 - method of accomplishing internal podalic version in the absence of, (Araya), 442 (Abst.)
- Anal shield, an improved, (Campbell), 873
- Anemia in pregnancy, (Galloway), 84, 136
- Antenatal care, how far can unsuccessful forceps cases be prevented by efficient, (Hendry), 444 (Abst.)
- Anterior lobe of the hypophysis, hormone of the, (Zondek and Aschheim), 139 (Abst.)
 - of the pituitary, (Zondek and Aschheim), 139 (Abst.)
- Appendix, routine removal of the, in all abdominal operations by a suitable technic, (Baldwin), 449

B

- Bandl's ring, maneuver to overcome the difficulty caused by, in internal podalic version, (Fernandez), 442 (Abst.)
- Basal metabolism, influence of ovarian function on the, (Heyn), 145 (Abst.)
 - relation of, to gestation, (Litzenberg and Carey), 550, 707

- Basedowoid disease in women, increase in, since the war and its explanation, (Firgau), 759 (Abst.)
- Birth rate, diminished, in Europe, marital fertility and, (Albrecht), 737
- Bladder complications, postpartum, (Prather), 215
- Bleeding, menstrual, parathormone in the control of, a study of the use of, (Allen and Goldthorpe), 344
- Blood calcium levels between and during menstrual periods, a comparison of, (Allen and Goldthorpe), 789
 - in normal pregnancy, ratio of urea nitrogen to total nonprotein nitrogen in the, (Denis, King and Briggs), 386
- loss in the third stage of labor, factors governing, (Calkins), 578, 701
- menstrual, regurgitation of, from one double uteri caused by congenital atresia, (Allen), 868
- of the pregnant woman, ovarian follicular hormone in the, a study of, (Smith, Margaret G.), 138 (Abst.)
- plasma, removal of, and the reinfusion of corpuscles in the treatment of the convulsive toxemia of pregnancy, (Irving and Taylor), 767, 883
- pressure, effects on, of pituitrin and oxytocin in the puerperium, (MacGregor), 125
- sedimentation, its history, theory and clinical significance, (Ostendorf), 293 (Abst.)
- serum and the vegetative system, potassium and calcium ion-concentration of the, ovarian function and, (Schultze), 145 (Abst.)
- sugar, fluctuation of, before and after an eclamptic convulsion, (Laferty, Nark and Sweeny), 113
- test, female hormone, clinical data obtained with the, (Frank and Goldberger), 142 (Abst.)
- Bone marrow stimulation in the puerperal woman by injection of pituitrin and intravenous glucose, and its clinical application, (Hofbauer), 761
- Books received, 296, 452
- Breech, forceps applied to the, (Varo), 445 (Abst.)

*Index to pages of the Journal. Vol. XVII, January-June, 1929. January, pages 1-150; February, pages 151-296; March, pages 297-452; April, pages 453-602; May, pages 603-760; June, pages 761-902.

Breech—Cont'd

- presentation, fetal mortality in, (King and Gladden), 78, 130
- is prophylactic external version advisable in, (King and Gladden), 78, 130
- operative treatment of, (Küstner), 446 (Abst.)
- prophylactic external version in, (McGuinness), 441 (Abst.)
- Brooklyn Gynecological Society, transactions of, 123, 125, 881, 883

C

- Cancer of the cervix, radiotherapy in the treatment of, (Dannreuther), 524, 718
- uterine, pyometra following radium therapy for, (Bland), 528, 718
- radium therapy for, pyometra following, (Bland), 528, 718
- Carbohydrate metabolism in toxemia of pregnancy, disturbances in, (Titus), 553, 706
- Carcinoma, myoma, and sarcoma developing in the same uterus, (Newell), 191
- of the cervix, early diagnosis and prevention of, (Pemberton and Smith), 165
- of the fundus of uterus following Watkins' interposition operation, (Corvese), 239
- of the ovary after the menopause associated with recurrence of uterine bleeding, (Strauss), 248
- uteri, radium therapy of, (Ward), 1, 126
- Castration, operative and x-ray, changes in the hypophysis of the rat after, (Schenk), 143 (Abst.)
- Cephalic version, Marmaduke B. Wright and, (Thoms), 814
- Cervix, cancer of the, radiotherapy in the treatment of, (Dannreuther), 524, 718
- carcinoma of the, early diagnosis and prevention of, (Pemberton and Smith), 165
- problems associated with the, (Huggins), 589, 689
- Cesarean section, abdominal scar following, endometriosis of an, (Williams), 102, 120
- a review of 109 cases, (Lull), 403, 417
- a study of 165 consecutive, including a comparison between 104 classical operations and 61 laparotrachelotomies, (Quigley), 597, 715
- at the Methodist Episcopal Maternity, a survey of, (Humpstone), 663

Cesarean section—Cont'd

- by Fritsch's technic, with a report of sixty consecutive cases without mortality, (Niemack), 860
- is it becoming too general, 741
- mercurochrome as a vaginal antiseptic before, (Mayes), 645, 723
- Chicago Gynecological Society, transactions of, 132, 267, 419, 728
- Cholecystography as an aid in determining gall bladder stasis in pregnancy, (Fogelson), 613, 731
- Chorioadenoma and choriocarcinoma of uterus, (Wolfe), 826, 882
- Classic forceps, modification of the, and its application, (Seides), 262
- Collective reviews:
 - A review of the gynecological literature of 1928, (Schochet), 885
 - New books, (Frank), 426
 - The obstetric literature of 1928, (Greenhill), 742
 - The Second International Congress of Radiology at Stockholm, July, 1928, (Stein), 275
- Colpotomy, intravaginal prolapse of the fallopian tube after, (Moulon-guet), 48 (Abst.)
- Conception and pregnancy, incretory influence of male sex glands on, (Reiprich), 148 (Abst.)
- Corpus luteum, biologic action of the, concerning the, (Ancel and Bouin), 144 (Abst.)
- Correspondence, 449, 733
- Craniotomy, some observations on, at the Woman's Clinic at Lund, (Fischer), 442 (Abst.)
- Curettage, early adenocarcinoma of the uterine body completely removed by, (Seides), 117
- Cystadenoma of the ovary, papillary, so-called everted variety of, (Dorland), 132

D

- Decidual formation of the peritoneal surface of the gravid uterus, (Hofbauer), 603
- reaction in extrauterine pregnancy, (Kline), 42
- Delivery, abdominal, of triplets, (Mann), 726
- Diabetic coma complicating pregnancy, (Merriam), 684
- Diseases of the alimentary and female genital systems, reciprocal relations between, (Walscheid), 104
- Dry labor, an analysis of 600 cases, (Schulze), 20

E

- Eclampsia, hepatic lesion in, (Dieckmann), 454, 696
 J. Whitridge Williams questionnaire on, a partial answer to the, (Titus), 553, 706
 Eclamptic convulsion, fluctuation of blood sugar before and after, (Laferty, Nark and Sweeny), 113
 toxemia, some physiologic aspects of, (LeDoux), 90, 130
 Ectopic gestation, relation of, to the associated uterine changes and vaginal bleeding, (Geist and Matus), 151
 report on seventy-six cases of, (Bubis), 74
 pregnancy, gross microscopic sections from specimens of, (Litzenberg), 121
 Egg cell, the primacy of the, (Westman), 144 (Abst.)
 Endometrioma, (Smith), 806
 Endometriosis, experimental, (Schochet), 328, 413
 of an abdominal scar following cesarean section, (Williams), 102, 120
 Episiotomy and the immediate postpartum repair of both old and new perineal injuries, (Titus), 448 (Abst.)
 constitutional indications for, (Bucura), 448 (Abst.)
 median, a new device for performing, (Michael), 265
 with modified operative technique, (Blevins), 197
 Extrauterine pregnancy, decidua reaction in, (Kline), 42
 full-term, with living child, (McCullough), 724

F

- Fallopian tube, intravaginal prolapse of the, after colpotomy, (Moulon-guet), 48 (Abst.)
 Female genital and alimentary systems, reciprocal relations between diseases of the, (Walscheid), 104
 hormone blood test, clinical data obtained with the, (Frank and Goldberger), 142 (Abst.)
 sex hormone, excretion of the, (Dohrn and Faure), 139 (Abst.)
 in the blood of women, variations in the, (Hirsch), 138 (Abst.)
 in the urine, diagnosis of early pregnancy through the detection of, (Mazer and Hoffman), 186
 especially in pregnant women, (Zondek), 139 (Abst.)
 of men, presence of the, (Laqueur, et al), 142 (Abst.)

Female sex hormone—Cont'd

- is the Allen Doisy test specific for the, (Dohrn), 142 (Abst.)
 Fetal death following external version, (Fruhinsholz), 441 (Abst.)
 mortality in breech presentations, (King and Gladden), 78, 130
 Fetus in utero, effects of x-ray and radium upon the, (Toombs), 516, 718
 Fibroid, degenerating, in a woman seventy-nine years of age, (Schockaert), 286 (Abst.)
 tumors of the vulva, (Fullerton), 284 (Abst.)
 Fibroids and fibrosis uteri, radium treatment of, (Cleland), 508, 718
 pathology of, remarks on, (Deaver and Reimann), 288 (Abst.)
 suppurating, (Nisot), 286 (Abst.)
 uterine, after the menopause, (Shaw), 285 (Abst.)
 necrobiosis of, (Patel and Denis), 287 (Abst.)
 treatment of, (Deaver and Reimann), 288 (Abst.)
 by myomectomy, (Giuseppi), 290 (Abst.)
 Fibromatous uterus, torsion of the, (Peightal), 363, 413
 Fibromyoma of the tube, a case of, (Meyer), 285 (Abst.)
 Fibromyomas, uterine, treatment of, (Keene and Block), 848, 880
 Fibromyomata of the uterus, degeneration of, (Seed), 286 (Abst.)
 parasitic, (Masson), 284 (Abst.)
 Fistula, vesicovaginal, repair of, (Hertzer), 114
 Fluctuation of blood sugar before and after an eclamptic convulsion, (Laferty, Nark and Sweeny), 113
 Forceps, application of, in the superior strait, (Schockaert), 445 (Abst.)
 applied to the breech, (Varo), 445 (Abst.)
 case, the failed, and its treatment, (Miller), 443 (Abst.)
 cases, observations on unsuccessful, (Miller), 444 (Abst.)
 unsuccessful, (Hendry), 444 (Abst.); (Shaw), 445 (Abst.)
 causation, management and end-results of, (Miller), 444 (Abst.)
 the classic, and its application, a modification of the, (Seides), 262
 Four-bladed speculum, (Nelson), 112

G

- Galactose, metabolism of, (Rowe and McGuinness), 351
 Gall bladder stasis in pregnancy, cholecystography as an aid in determining, (Fogelson), 613, 731

- Gestation, ectopic, relation of, to the associated uterine changes and vaginal bleeding, (Geist and Matus), 151
 report on seventy-six cases, (Bubis), 74
 relation of basal metabolism to, (Litzenberg and Carey), 550, 707
- Gonads, central regulation of the, the pituitary gland and the, (Liebesny), 141 (Abst.)
- Gravid uterus, peritoneal surface of the, decidual formation on the, (Hofbauer), 603
- Gynecologic ailments, use of testicular preparations in, (Vignes), 149 (Abst.)
 literature of 1928, a review of the, (Schochet), 885 (Collective Review)
- Gynecology, progress of teaching and practice in, during the last four decades, (Hirst), 209
 protein therapy in, (Hibbert), 227, 272

H

- Head presentations, prophylactic fixation of the anterior arm in performing version and extraction in, (Houël and Jahier), 441 (Abst.)
- Heart disease, pregnancy complicated by, experiences in the management of, (Pardee), 255
- Hebosteotomy, successful case of, with an auto-transplantation between the severed ends of the pubic bone, (Schmidt), 447 (Abst.)
- Hemiplegia during pregnancy, with the report of a case, (Scott), 401, 419
- Hepatic lesion in eclampsia, (Dieckmann), 454, 696
- High forceps operations, evil results of, and their prevention, (Franqué), 445 (Abst.)
- Homoplastic ovarian transplantation, transplantation material in, (Sippel), 148 (Abst.)
- Hormonal sterilization of female animals, (Haberlandt), 147 (Abst.)
 by means of insulin, (Haberlandt), 147 (Abst.)
 with insulin, (Vogt), 146 (Abst.)
- Hormone and pregnancy, (Aschheim), 140 (Abst.)
 female sex, content in the blood of women, variations in the, (Hirsch), 138 (Abst.)
 in the urine, especially in pregnant women, (Zondek), 139 (Abst.)
 of men, the presence of, (Laqueur, et al), 142 (Abst.)

Hormone, female sex—Cont'd

- is the Allen Doisy test specific for the, (Dohrn), 142 (Abst.)
 the excretion of the, (Dohrn and Faure), 139 (Abst.)
 of the anterior lobe of the hypophysis, (Zondek and Aschheim), 139 (Abst.)
 of the ovary and the anterior lobe of the hypophysis, (Zondek), 140 (Abst.)
 ovarian follicular, effects of injections of, on body growth and sexual development of male and female rats, (Bugbee and Simond), 137 (Abst.)
 in the blood of the pregnant woman, study of the, (Smith, Margaret G.), 138 (Abst.)
 standardization of the, (Uhlmann), 150 (Abst.)
 ovum and, (Aschheim and Zondek), 143 (Abst.)
- Hormones of ovary and anterior pituitary, 137 (Selected Abstracts)
 of the anterior lobe of the pituitary and of the ovary in the urine of pregnant women, (Aschheim and Zondek), 141 (Abst.)
 sex, vegetable substances with activity resembling, (Dohrn, Faure, Poll and Blotvogel), 138 (Abst.)
- Hyperemesis gravidarum, observations on sixty cases of, (Peckham), 776
- Hyperthyroidism complicating pregnancy, (Falls), 536, 709
- Hypophysis, anterior lobe of the, and the ovary, hormone of the, (Zondek), 140 (Abst.); (Zondek and Aschheim), 139 (Abst.)
 of the rat, changes in the, after operative and x-ray castration, (Schenk), 143 (Abst.)
- Hypothyroidism, relation of, to obstetrics and gynecology, (O'Keefe), 294 (Abst.)

I

- Impetigo or pyodermatitis neonatorum, (Reed), 49, 133
- Induction of labor, comparative study based on 500 consecutive cases of, (Reis), 392, 419
 medical, (De Guchteneere), 440 (Abst.)
 with animal bladders containing glycerine, (Gibberd), 439 (Abst.)
- Infertility, uterotubal insufflation followed by pregnancy in 205 cases out of a series of 2000 cases of, (Rubin), 484, 692

- In memoriam—George Clark Mosher, 453
- Insufflation, uterotubal, followed by pregnancy in 205 cases out of a series of 2000 cases of infertility, (Rubin), 484, 692
- Insulin and ovarian function, (Vogt), 145 (Abst.)
- effect on the ovary, dependence of, (Vogt), 146 (Abst.)
- hormonal sterilization of female animals by means of, (Haberlandt), 147 (Abst.)
- hormonal sterilization of female animals with, (Vogt), 146 (Abst.)
- Internal podalic version, maneuver to overcome the difficulty caused by Bandl's ring in, (Fernandez), 442 (Abst.)
- method of accomplishing, in the absence of amniotic fluid, (Araya), 442 (Abst.)
- Intestinal obstruction simulating twisted ovarian cyst, case of, (Fleischer), 109
- Intra- and extrauterine pregnancy, combined, advanced to the sixth month, (Duncan), 878
- Intraperitoneal operations, vaginal approach for certain, (Babcock), 573, 695
- Intrauterine applications of antiseptic solutions, prophylactic treatment of puerperal infection by, (Rosenfeld), 408
- Items, 884

L

- Labor and the puerperium, changes in the leucocytes during, (Jarcho), 13
- dry, an analysis of 600 cases, (Schulze), 20
- induction of, comparative study based on 500 consecutive cases of, (Reis), 392, 419
- with animal bladders containing glycerine, (Gibberd), 439 (Abst.)
- medical induction of, (De Guchteneere), 440 (Abst.)
- test of, results of expectant treatment in contracted pelvis and the, (Odagesco), 447 (Abst.)
- third stage of, factors governing blood loss in, (Calkins), 578, 701
- Lacerations of the perineum, complete, and their surgical treatment, (Phaneuf), 475, 687
- Laparotomies for myoma of uterus, (Essen-Möller), 291 (Abst.)
- Laparotrachelotomies, 61, comparison between 104 classical operations and, (Quigley), 597, 715

- Leiomyoblastoma and papillary cystoma of the ovary, report of a case of, (Stein and Bloom), 820
- Leucocytes during labor and the puerperium, changes in the, (Jarcho), 13
- Leucorrhea, treatment of, (Payne), 841, 879
- Lipiodol injection, effect of, on the tubes, (Ries), 728

M

- Magnesium sulphate dosage in synergistic analgesia and in tetanus, (Beckman), 735
- Malignancy, histologic, estimation of, from biopsy sections, (Hueper), 733
- Marital fertility and diminished birth rate in Europe, (Albrecht), 737 (Abst.)
- Maternal morbidity, postpartum, some factors in, (Toland), 411, 416
- mortality and its prevention, (Emmons), 738
- welfare, 738
- Median episiotomy, a new device for performing, (Michael), 265
- Membranes, untimely rupture of the, (Mayer), 327 (Abst.)
- Menopause, carcinoma of the ovary after the, associated with recurrence of uterine bleeding, (Strauss), 248
- menorrhagia of adolescence and of the, radium in the treatment of, (Stacy and Mussey), 502, 718
- uterine fibroids after the, (Shaw), 285 (Abst.)
- Menorrhagia as a symptom of myxedema, (Gardiner-Hill and Smith), 226 (Abst.)
- of adolescence and of the menopause, radium in the treatment of, (Stacy and Mussey), 502, 718
- Menstrual bleeding, parathormone in the control of, a study of the use of, (Allen and Goldthorpe), 344
- blood, regurgitation of, from one of double uteri caused by congenital atresia, (Allen), 868
- periods, blood calcium levels between and during, a comparison of, (Allen and Goldthorpe), 789
- Mercurochrome as a vaginal antiseptic before cesarean section, (Mayes), 645, 723
- Metabolism, carbohydrate, in toxemia of pregnancy, disturbances in, (Titus), 553, 706
- of galactose, (Rowe and McGuinness), 351
- Metrophlebitis and thrombophlebitis of the pelvic veins, is surgical intervention justifiable in the treatment of, (Polak), 467, 698

- Midwifery, history of British, (Spencer), 292 (Abst.)
- Miscarriages, pathology of 104 consecutive, in private obstetric practice, a review of the, (Huntington), 33, 121
- Mortality, fetal, in breech presentations, (King and Gladden), 78, 130
maternal, and its prevention, (Emmons), 738
- Mucous membrane of the uterus, experimental study of the excretory functions of the, (Sakuma), 293
- Myoma, 284 (Selected Abstracts)
and other nonmalignant lesions of the uterus, results of x-ray therapy in, (Laws), 855
of uterus, one thousand laparotomies for, (Essen-Möller), 291 (Abst.)
sarcoma, and carcinoma developing in the same uterus, (Newell), 191
uterine hemorrhages in, and hemorrhagic uterine affections, etiologic and pathogenic study of, (Castano), 284 (Abst.)
- Myomata, advantages of conservative operations for, over radical operations or roentgen castration, (Aschner), 289 (Abst.)
inflammatory changes in, (Frankl), 287 (Abst.)
multiple, with malignant degeneration of several nodules, a case of, (Ulesco-Stroganowa), 288 (Abst.)
- Myomatous uterus, supravaginal amputation of the, or total extirpation, (Ott), 291
- Myomectomies, (Goinard and Goinard), 290 (Abst.)
- Myosarcoma of the uterus, frequency and valuation of, (Imhäuser), 288 (Abst.)
- Myxedema, menorrhagia as a symptom of, (Gardiner-Hill and Smith), 226 (Abst.)

N

- Necrobiosis of uterine fibroids, (Patel and Denis), 287 (Abst.)
- Neurologic symptoms in the pregnant woman, (Burr), 653, 727
- New books, (Frank), 426 (Collective Review)
- New Orleans Gynecological and Obstetrical Society, transactions of, 130
- New York Obstetrical Society, transactions of, 120, 413, 720

O

- Obstetric attempts, unsuccessful, (Stoeckel), 443 (Abst.)
bed, a new, (Williamson), 875

Obstetric—Cont'd

- literature of 1928, (Greenhill), 742 (Collective Review)
operations, 439 (Selected Abstracts)
- Obstetrical and Gynecological Society of Baltimore, inaugural meeting of, 884
- Obstetrical Society of Philadelphia, 416, 724, 726, 727, 878
- Obstetrics and gynecology, relation of hypothyroidism to, (O'Keefe), 294 (Abst.)
operative, teaching of, (Mendenhall), 583, 712
- Ovarian cyst, twisted intestinal obstruction simulating, case of, (Fleischer), 109
follicular hormone, effects of injections of, on body growth and sexual development of male and female rats, (Bugbee and Simond), 137 (Abst.)
in the blood of the pregnant woman, a study of the, (Smith, Margaret G.), 138 (Abst.)
- function, influence of, on the basal metabolism, (Heyn), 145 (Abst.)
insulin and, (Vogt), 145 (Abst.)
potassium and calcium ion-concentration on the blood serum and the vegetative system, (Schultze), 145 (Abst.)
hormone, standardization of the, (Uhlmann), 150 (Abst.)
substances, various, changes in the ovaries and other organs of animals injected with, (Terada), 137 (Abst.)
transplantation, homoplastic, transplantation material in, (Sipfel), 148 (Abst.)
- Ovaries and other organs of animals injected with various ovarian substances, changes in the, (Terada), 137 (Abst.)
transplantation of artificially preserved, further investigations on, (Lipschuetz), 149 (Abst.)
- Ovary and the anterior lobe of the hypophysis, hormone of the, (Zondek), 140 (Abst.)
and anterior pituitary, hormones of, 137 (Selected Abstracts)
carcinoma of the, after the menopause associated with recurrence of uterine bleeding, (Strauss), 248
cystadenoma of the, so-called everted variety of papillary, (Dorland), 132
dependence of insulin effect on the, (Vogt), 146 (Abst.)
innervation of the, (Lhermitte and Dupont), 292 (Abst.)

Ovary—Cont'd

- leiomyoblastoma and papillary cystoma of the, report of a case of, (Stein and Bloom), 820
- papillary cystadenoma of the, so-called everted variety of, (Dorland), 132
- Ovum and hormone, (Aschheim and Zondek), 143 (Abst.)

P

- Parasitic fibromyomata, (Masson), 284 (Abst.)
- Parathormone in the control of menstrual bleeding, a study of the use of, (Allen and Goldthorpe), 344
- Pathology of fibroids, remarks on, (Deaver and Reimann), 288 (Abst.)
 - of 104 consecutive miscarriages in private obstetric practice, a review of the, (Huntington), 32, 121
- Pelves, contracted, and the test of labor, results of expectant treatment in, (Odagesco), 447
- Pelvic veins, metrophlebitis and thrombophlebitis of the, is surgical intervention justifiable in the treatment of, (Polak), 467, 698
- Pelvis, permanent enlargement of the, (Fossati), 446 (Abst.)
- Perineal injuries, episiotomy and the immediate postpartum repair of both old and new, (Titus), 448 (Abst.)
- Perineum, complete lacerations of the, and their surgical treatment, (Phaneuf), 475, 687
- Peritoneal surface of the gravid uterus, decidual formation on the, (Hofbauer), 603
- Peritoneum, reactions of the, (Kennedy), 636, 694
- Pituitary, anterior, and ovary, hormones of, 137 (Selected Abstracts)
 - anterior lobe of the, (Zondek and Aschheim), 139 (Abst.)
 - hormones of the, and of the ovary in the urine of pregnant women, (Aschheim and Zondek), 141 (Abst.)
 - gland and the central regulation of the gonads, (Liebesny), 141 (Abst.)
- Pituitrin and oxytocin in the puerperium, effects on blood pressure of, (MacGregor), 125
- Placenta accreta, report of a case of, with a discussion of its treatment and the unusual sequelae, (Wilson), 58
 - extract, pharmacologic research of the action of, (Kosaka), 254 (Abst.)

Placenta—Cont'd

- premature separation of a normally implanted, during pregnancy, (Hillis), 132
- Placental infarcts, roentgenographic study of, (Thoms), 176
 - sclerosis, recurrent and habitual death of fetus, (Vermelin), 854 (Abst.)
- Postpartum bladder complications, (Prather), 215
 - maternal morbidity, some factors in, (Toland), 411, 416
- Pregnancy, anemia in, (Galloway), 84, 136
 - bilateral tubal, with rupture of both tubes, (Johnson and Diasio), 116
 - blood in normal, ratio of urea nitrogen to total nonprotein nitrogen in the, (Denis, King and Briggs), 386
 - cholecystography as an aid in determining gall bladder stasis in, (Fogelson), 613, 731
 - combined intra- and extrauterine, advanced to the sixth month, (Duncan), 878
 - complicated by heart disease, experiences in the management of, (Pardee), 255
 - convulsive toxemia of, the removal of blood plasma and the reinfusion of corpuscles in the treatment of the, (Irving and Taylor), 767, 883
 - diabetic coma complicating, (Merriam), 684
 - early diagnosis of, through the detection of female sex hormone in the urine, (Mazer and Hoffman), 186
 - ectopic, gross microscopic sections from specimens of, (Litzenberg), 121
 - extemporaneous evacuation of the uterus at the end of, (Delmas), 440 (Abst.)
 - extrauterine, decidual reaction in, (Kline), 42
 - full-term extrauterine, with living child, (McCullough), 724
 - gall bladder stasis in, cholecystography as an aid in determining, (Fogelson), 613, 731
 - hemiplegia during, with the report of a case, (Scott), 401, 419
 - hormone and, (Aschheim), 140 (Abst.)
 - hyperthyroidism complicating, (Falls), 536, 709
 - premature separation of a normally implanted placenta during, (Hillis), 132
 - renal derangements in, modern conceptions of, (Kolischer), 661, 730
 - test, (Aschheim and Zondek), 141 (Abst.)

Pregnancy—Cont'd

- toxemia of, with jaundice, (Stein and Leventhal), 244
- tubal, bilateral, with rupture of both tubes, (Johnson and Diasio), 116
- uterotubal insufflation followed by, in 205 cases out of a series of 2000 cases of infertility, (Rubin), 484, 692
- Pregnant woman, neurologic symptoms in the, (Burr), 653, 727
- women, serum from, increased uterine development by means of, (Trivino), 137 (Abst.)
- Procidencia, (Smith, Graves, and Pemberton), 669
- Prolapse of the fallopian tube, intra-vaginal, after colpotomy, (Moulouguet), 48 (Abst.)
- of the uterus, interposition operation for, (Baer and Reis), 233, 269
- Protein therapy in gynecology, (Hilbert), 227, 272
- Puerperal fever, streptococcus antitoxin in, therapeutic value of a new concentrated, (Lash), 297, 424
- infection, prophylactic treatment of, by intrauterine applications of of antiseptic solutions, (Rosenfeld), 408
- morbidity at the Greenpoint Hospital, (Kuperstein), 865, 881
- woman, bone marrow stimulation in the, by injection of pituitrin and intravenous glucose, and its clinical application, (Hofbauer), 761
- Puerperium, infection in the, with analysis of 8000 cases, (Adair and Tiber), 559, 702
- pituitrin and oxytocin, effects on blood pressure of, (MacGregor), 125
- Pyodermatitis neonatorum, impetigo or, (Reed), 49, 133
- Pyometra following radium therapy for uterine cancer, (Bland), 528, 718

R

- Radiology, the Second International Congress of, at Stockholm, July, 1928, a résumé of important papers relating to gynecology, (Stein), 275 (Collective Review)
- Radiotherapy in the treatment of cancer of the cervix, (Dannreuther), 524, 718
- Radium in the treatment of menorrhagia of adolescence and of the menopause, (Stacy and Mussey), 502, 718
- therapy for uterine cancer, pyometra following, (Bland), 528, 718
- of carcinoma uteri, (Ward), 1, 126
- treatment of fibroids and fibrosis uteri, (Cleland), 508, 718

Readers' forum, 295, 741

- Rectum, severance of, traumatic perforation of uterus with, (Maxwell), 96
- Renal derangements in pregnancy, modern conceptions of, (Kolischer), 661, 730
- Reproduction, cycle of, effect of metabolism of galactose on the tolerance of, (Rowe and McGuinness), 351
- Roentgenographic study of placental infarcts, (Thoms), 176
- Rupture of both tubes, bilateral tubal pregnancy with, (Johnson and Diasio), 116
- of the membranes, untimely, (Mayer), 327 (Abst.)

S

- Sarcoma, myoma, and carcinoma developing in the same uterus, (Newell), 191
- Sclerosis, recurrent placental, with habitual death of fetus, (Vermelin), 854 (Abst.)
- Selected Abstracts:
 - Hormones of ovary and anterior pituitary, 137
 - Miscellaneous, 48, 226, 254, 292, 327, 737, 759, 854
 - Myoma, 284
 - Obstetric operations, 439
- Seminal fluid, biologic sterilization of the female with injections of, (Castro), 147 (Abst.)
- Serosa and serous surfaces, effects of amniotic fluid on, (Warren), 760 (Abst.)
- Serum from pregnant women, increased uterine development by means of, (Trivino), 137
- Sex glands, male, incertory influence of, on conception and pregnancy, (Reiprich), 148 (Abst.)
- hormones, tokoinine, vegetable substances with activity resembling, (Dohrn. Faure, Poll, and Blotvogel), 138 (Abst.)
- is there a hormonal influence on, (Uhlmann), 144 (Abst.)
- Sexual development of male and female rats, effects of injections of ovarian follicular hormone on body growth and, (Bugbee and Simond), 137 (Abst.)
- Sickness among males and females, causes of, at different ages, 292 (Abst.)
- Sloane Hospital for Women, its development, significance and possibilities, (Williams), 795
- Society Transactions:
 - Brooklyn Gynecological Society, 123, 125, 881, 883
 - Chicago Gynecological Society, 132, 267, 419, 728

Society Transactions—Cont'd

- New Orleans Gynecological and Obstetrical Society, 130
 New York Obstetrical Society, 120, 413, 720
 Obstetrical Society of Philadelphia, 416, 724, 726, 727, 878
 Speculum, a four-bladed, (Nelson), 112
 Spermatozoon, sterility with special reference to the, (Mason), 376
 Sterility, statistical and clinical study of 1000 cases of, (Macomber), 621, 720
 with special reference to the spermatozoon, (Mason), 376
 Sterilization, biologic, of the female with injections of seminal fluid, (Castro), 147 (Abst.)
 hormonal, of female animals, (Haberlandt), 147 (Abst.)
 by means of insulin, (Haberlandt), 147 (Abst.)
 with insulin, (Vogt), 146 (Abst.)
 Streptococcus antitoxin in puerperal fever, the therapeutic value of a new concentrated, (Lash), 297, 424
 Suprarenal virilism, (Fawcett, Hadfield, and Phillips), 149 (Abst.)
 Symphysiotomy of Frank, partial symphysiotomy and the, (Zarate), 446 (Abst.)

T

- Testicular preparations, use of, in gynecologic ailments, (Vignes), 149 (Abst.)
 Third stage of labor, factors governing blood loss in, (Calkins), 578, 701
 Tokoinine, vegetable substances with activity resembling sex hormones, (Dohrn, Faure, Poll, and Blotvogel), 138 (Abst.)
 Torsion of the fibromatous uterus, (Peightal), 363, 413
 Toxemia, eclamptic, some physiologic aspects of, (LeDoux), 90, 130
 of pregnancy, convulsive, the removal of blood plasma and the reinfusion of corpuscles in the treatment of the, (Irving and Taylor), 767, 883
 severe, with jaundice, (Stein and Leventhal), 244
 Triplets, abdominal delivery of, (Mann), 726
 Tubal insufflation test, further simplification of the, (Jacoby), 871
 pregnancy, bilateral, with rupture of both tubes, (Johnson and Diasio), 116
 Tube, fibromyoma of the, a case of, (Meyer), 285 (Abst.)

- Tubes, effect of lipiodol injection on the, (Ries), 728
 rupture of both, bilateral tubal pregnancy with, (Johnson and Diasio), 116

U

- Umbilical cord, varix of the, with report of a case, (Adair and McDonald), 836
 Urea nitrogen, ratio of, to total non-protein nitrogen in the blood in normal pregnancy, (Denis, King and Briggs), 386
 Urine, female sex hormone in the, diagnosis of early pregnancy through the detection of, (Mazer and Hoffman), 186
 especially in pregnant women, (Zondek), 139 (Abst.)
 of men, presence of the female sex hormone in, (Laqueur, et al.), 142 (Abst.)
 of pregnant women, hormones of the anterior lobe of the pituitary and of the ovary in the, (Aschheim and Zondek), 141 (Abst.)
 Uterine bleeding, carcinoma of the ovary after the menopause associated with recurrence of, (Strauss), 248
 body, early adenocarcinoma of, completely removed by curettage, (Seides), 117
 cancer, pyometra following radium therapy for, (Bland), 528, 718
 development, increased, by means of serum from pregnant women, (Trivino), 137 (Abst.)
 fibroids after the menopause, (Shaw), 285 (Abst.)
 necrobiosis of, (Patel and Denis), 287 (Abst.)
 treatment of, (Deaver and Reimann), 288 (Abst.)
 by myomectomy, (Giuseppi), 290 (Abst.)
 fibromyomas, treatment of, (Keene and Block), 848, 880
 hemorrhages in myoma and hemorrhagic uterine affections, etiology and pathogenic study of, (Castano), 284 (Abst.)
 injuries, treatment of, (Schwartz), 66, 123
 mucosa, pathologic and histologic changes in the, due to various kinds of poisons, (Sakuma), 294 (Abst.)
 Uterotubal insufflation followed by pregnancy in 205 cases out of a series of 2000 cases of infertility, (Rubin), 484, 692

Uterus, abscess of the wall of the, with hemolytic streptococcus, (Masset), 267
 carcinoma of fundus of, following Watkins' interposition operation, (Corvèse), 239
 chorioadenoma and choriocarcinoma of, (Wolfe), 826, 882
 extemporaneous evacuation of the, at the end of pregnancy, (Delmas), 440 (Abst.)
 fibromatous torsion of the, (Peightal), 363, 413
 fibromyomata of the, degeneration of, (Seed), 286 (Abst.)
 gravid, decidual formation on the peritoneal surface of the, (Hofbauer), 603
 injection of ether into the, (Miles), 451 (Abst.)
 mucous membrane of the, experimental study of the excretory functions of the, (Sakuma), 293 (Abst.)
 myoma and other nonmalignant lesions of the, results of x-ray therapy in, (Laws), 855
 one thousand laparotomies for, (Essen-Möller), 291 (Abst.)
 sarcoma and carcinoma developing in the same, (Newell), 191
 myomatous, supravaginal amputation of the, or total extirpation, (Ott), 291 (Abst.)
 myosarcoma of the, frequency and valuation of, (Imhäuser), 288 (Abst.)
 of the guinea pig during the estrous cycle, rhythmic variations in the vascularity of the, (Markee), 205, 268
 perforation of, traumatic, with severance of rectum, (Maxwell), 96
 prolapse of the, interposition operation for, (Baer and Reis), 233, 269
 traumatic perforation of, with severance of rectum, (Maxwell), 96

V

Vaginal antiseptic before cesarean section, mercurochrome as a, (Mayes), 645, 723
 approach for certain intraperitoneal operations, (Babcock), 573, 695
 Varix of the umbilical cord with report of a case, (Adair and McDonald), 836
 Version and extraction of head presentations, prophylactic fixation of the anterior arm in performing, (Houël and Jahier), 441 (Abst.)
 cephalic, Marmaduke B. Wright and, (Thoms), 814
 external, fetal death following, (Fruhinsholz), 441 (Abst.)
 internal podalic, maneuver to overcome the difficulty caused by Bandl's ring in, (Fernandez), 442 (Abst.)
 method of accomplishing, in the absence of amniotic fluid, (Araya), 442 (Abst.)
 prophylactic external, in breech presentation, (McGuinness), 441 (Abst.)
 in breech presentations, is it advisable, (King and Gladden), 78, 130
 Vesicovaginal fistula, repair of, (Hertzer), 114
 Vulva, fibroid tumors of the, (Fullerton), 284 (Abst.)

W

Watkins' interposition operation, carcinoma of fundus of uterus following, (Corvèse), 239
 Wright, Marmaduke B., and cephalic version, (Thoms), 814

X

X-ray and radium, effects of, upon the fetus in utero, (Toombs), 516, 718
 therapy in myoma and other non-malignant lesions of the uterus, results of, (Laws), 855

VALUABLE SUGGESTIONS FOR CONTRIBUTORS TO THE AMERICAN JOURNAL OF OBSTETRICS AND GYNECOLOGY

"The four rules for the preparation of an article will then be: (1) Have something to say; (2) Say it; (3) Stop as soon as you have said it; (4) Give the paper a proper title."¹

Let your phraseology express one meaning and one only. Be clear.²

Manuscript.—Manuscripts should be typewritten, with wide margins, and double spaced, on one side of paper 8½ by 11 inches in size. The original copy should be sent to the "Journal" and the carbon copy retained by the author: Number the leaves consecutively, beginning with the title page. Put your name and address on the manuscript.

Illustrations.—Illustrations should be clear, preferably pen-and-ink drawings. Of photographs send a good print rather than a negative. Have lettering parallel to the bottom and top margins, and of sufficient size to be clear if cut is to be reduced. Tracings should be in black-and-white; avoid colors. Write your name on back of each picture; number them in one series (Fig. 1, etc.) to the end, and indicate in margin of the manuscript about where each is to be printed. See that the text references and "figures" correspond. Legends for illustrations should be written on a separate sheet.³

Bibliographic References.—Give only references actually consulted. If an article is known only through an abstract give reference to the abstract in addition to that of the source. References are printed to be of help in further reading; therefore, they must be complete, concise, and correct. Follow the style of the "Index Medicus" and "Index-Catalog of the Library of the Surgeon-General's Office." Be conservative in the use of abbreviations.⁴

Arrangement.—As authors are quoted in the text give each a number in the order of citation, and number the bibliographic reference with the same number. Arrange the references in a list at the end of the article in the order of the numbers (see below), or arrange items in alphabetical order according to last names of authors, and distinguish between articles by the same author by the use of the date after his name in the text.

Footnotes.—Where an author wishes to use footnotes at bottom of each page instead of the bibliography at end of article, the footnotes should be written in the text, but separated from it by horizontal lines above and below, or *better*, place them at bottom of each page. Use figures to indicate these footnotes, and number consecutively (1, 2, 3, etc.) throughout the article. If in addition to the bibliography mentioned above it is desired to use footnotes on certain pages, these can be indicated by an asterisk (*).

Final Reading.—Let some one other than the author read the manuscript with these directions in mind.

Shipment.—Send manuscript flat, postage paid, to the editor, Dr. Geo. W. Kosmak, 23 East 93rd St., New York City.

Proof Reading.—Read carefully, with special attention to spelling of names and bibliographic data. Make corrections in the *margin* only with lines drawn from the revision to the point of change in the text. Answer queries in the proof by making correction or crossing out query. Verify your references from the sources, not from your carbon copy.

References. (Read these.)

1. Billings, J. S.: Our Medical Literature, Trans. VII Intern. Med. Congress, Lond. 1: 54-70, 1881.
2. Mayer, Emil: Medical Literature and Its Preparation, Med. Record, N. Y. 87: 1010-1021, July, 1915.
- Allbutt, T. C.: Notes on the Composition of Scientific Papers. London, Macmillan, 1904.
- McCrae, Thomas: The Use of Words, J. A. M. A. 65: 135-139, 1915.
3. Suggestions to Medical Authors, Issued by the A. M. A. Press, Chic., A. M. A., [1914 (?)].
4. Place, F.: Bibliographic Style in Medical Literature, Med. Record, N. Y. 83: 157-160, 1913.

